

Area-Wide Soil Contamination Task Force Report

Draft of April 16, 2003

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Executive Summary

1. Introduction

This report is the product of a 17-person Task Force chartered by the Departments of Agriculture, Ecology, and Health and the Office of Community Development (the Agencies) charged with developing findings and recommendations related to area-wide soil contamination in Washington State. The Task Force process was carried out over 18 months, from January 2002 to June 2003.

Task Force deliberations focused on understanding and mapping the nature and extent of arsenic and lead area-wide soil contamination from three historical sources: emissions from metal smelters, past use of pesticides containing lead arsenate, and past use of leaded gasoline, and on developing recommendations about effective, practical, and affordable steps organizations and individuals can take to reduce the potential for exposure to arsenic and lead soil contamination. The foundation of the Task Force recommendations calls for the Agencies to initiate a broad-based education and awareness building campaign about the area-wide soil contamination problem where elevated levels of arsenic and lead in soil are likely, and to support and encourage actions individuals can take to reduce the likelihood that they will be exposed to arsenic and lead in soil. To complement broad-based education and awareness building, the Task Force also recommends specific activities for a number of land-use situations, with an emphasis on child-use areas. The Task Force also recommends creation of an alternative pathway through the Model Toxics Control Act for properties within area-wide soil contamination areas.

This report is organized as follows. Section 2 briefly describes the project background, including why the Task Force was chartered. Section 3 describes the Task Force composition, process, and information gathered to support Task Force deliberations. Section 4 describes Task Force findings and recommendations on the nature and extent of area-wide soil contamination in Washington State, and Section 5 describes the Task Force's approach to developing recommendations on actions to address area-wide soil contamination, including information on the full range of protection measures considered by the Task Force and the guiding principles used by the Task Force to inform their recommendations.

Sections 6, 7, and 8 describe the Task Force's foundation recommendation on education and awareness building, additional steps that should be taken to address area-wide soil contamination in specific land-use

scenarios, with an emphasis on child-use areas, and real estate disclosure. Section 9 contains recommendations on developing an alternative approach under the Model Toxics Control Act for area-wide soil contamination areas. Section 10 contains recommendations for additional information and data gathering, Section 11 outlines cost estimates for the Task Force's recommendations and possible funding sources, and Section 12 provides recommendations on implementation priorities. The report finishes with a summary and conclusions and is supported by a number of appendices to more fully document the Task Force's work, including a glossary of terms and uses and a summary of public comments received by the Task Force prior to finalizing this report.

2. Project Background and Task Force Charge

This section describes the context for the project, the reasons the Agencies decided to seek advice on area-wide soil contamination from a Task Force, and the Task Force charge.

Context for the Project and Reasons for the Task Force

Soil in large areas of Washington State is contaminated with low-to-moderate levels of arsenic and lead. Contamination was caused largely by a number of historical sources, including past air emissions from metal smelting operations, historical application of lead-arsenate-based pesticides, and past use of leaded gasoline. As Washington's population has grown, many areas potentially contaminated by these historical sources have been developed into residential neighborhoods, schools, and parks. These development activities, which continue today, have created pressures for cleanup and raised a variety of health, environmental, and marketplace concerns. In particular, widespread low-to-moderate levels of soil contamination present special challenges with respect to human health protection, land use conversion, financial impacts, and residents' awareness. These concerns were among the issues identified by the Model Toxics Control Act (MTCA) Policy Advisory Committee (PAC), established in 1994 by the Washington Legislature to review implementation of the Washington State Cleanup Law. In their final report, the MTCA PAC recommended that the Department of Ecology (Ecology) take steps to more effectively address area-wide soil contamination problems.

In early 2000, the Departments of Agriculture, Ecology, and Health and the Office of Community Development concluded that effective long-term solutions to area-wide soil contamination problems would require looking beyond traditional cleanup processes and agency boundaries. In particular, the

agencies identified several interconnected challenges posed by widespread low-to-moderate level soil contamination.

- **Human Health Protection:** Homes, schools, and parks are currently located in many of the contaminated areas. In some cases, development of contaminated areas has resulted in the removal, capping, or mixing of contaminated soils. However, in other cases, contaminated soils remain at levels that may pose chronic health threats to people living nearby. Small children are particularly susceptible to contaminated soils because of higher exposures and greater sensitivity to hazardous substances.
- **Land Use Conversions:** Washington's high population growth has resulted in many agricultural and forested areas and other open space being converted to residential uses. This land use conversion can bring people into contact with contaminated areas that previously may not have been accessible to the public.
- **Financial Impacts:** Citizens and land developers have purchased or built homes in areas with contaminated soils. This can create significant financial problems that may include paying for cleanup, reduced property values, and difficulties selling homes.
- **Citizen Awareness:** Many citizens are unaware that soil at their homes, future homes, and/or children's schools may contain elevated levels of hazardous substances. Consequently, they are unable to take steps to reduce health or financial impacts.

Although federal and state cleanup programs have been in place for over 20 years and have successfully provided for the cleanup of hundreds of contaminated sites, the Agencies concluded that new approaches and stronger partnerships would be needed to successfully respond to the concerns associated with area-wide soil contamination. Area-wide soil contamination problems are different from more typical cleanup sites in a number of important aspects.

- The geographic scale of these problems is significantly greater than contamination problems more generally addressed by state and federal cleanup programs.
- Current cleanup approaches do not provide a systematic framework for integrating traditional cleanup strategies with local land-use planning and permitting.

- Agencies lack key information needed to effectively address area-wide soil contamination problems, for example, information on the full scope of the problem and on stakeholder views.

To facilitate identification, discussion, and resolution of the broad range of concerns surrounding the area-wide soil contamination issue, the Agencies proposed to form a stakeholder Task Force to consider the issues and offer findings and recommendations. In June 2001, the Washington Legislature appropriated \$1.2 million to form and support the Task Force, and the Agencies began to identify potential Task Force members and initiated the process of hiring a project support contractor.

What is Area-Wide Soil Contamination?

Area-wide soil contamination is low-to-moderate level contamination that is dispersed over a large geographic area, ranging in size from several hundred acres to many square miles. Area-wide contamination areas are different from most cleanup sites, which are typically much smaller and have higher levels of contamination.

Task Force Charge

In January 2002, the Agencies chartered the Area-Wide Soil Contamination Task Force (Task Force) to consider the special challenges posed by area-wide soil contamination and offer findings and recommendations about a statewide strategy for meeting these challenges. The Agencies asked the Task Force to give advice on steps the Agencies, other organizations, and individuals could take to improve or replace current approaches to addressing widespread areas of low-to-moderate soil contamination. In particular, the Agencies asked the Task Force to provide findings and recommendations on four sets of questions:

- What is currently known about the nature and extent of arsenic and lead soil contamination in Washington State? What steps should be taken to improve our understanding of the location and magnitude of arsenic and lead soil contamination?
- What are technically feasible measures for addressing widespread low-to-moderate soil contamination problems? What is the full range of actions that might be considered to address widespread low-to-moderate levels of soil contamination?

- What changes are needed to eliminate barriers in addressing area-wide soil contamination problems? How can agencies facilitate cleanup of area-wide soil contamination problems under the current legal system?
- What agencies need to play a role in addressing area-wide soil contamination problems and what are possible funding sources?

The Agencies also identified three areas as beyond the scope of the Task Force process, including the MTCA cleanup standards, ongoing cleanup processes, and current agricultural practices.

Even though other contaminants may pose area-wide soil contamination problems, the Agencies asked the Task Force to focus on problems associated with arsenic and lead. The Agencies chose to focus on arsenic and lead based on information pointing to potential widespread distribution of these contaminants in both eastern and western Washington at concentrations that could exceed state cleanup levels and the persistence of arsenic and lead in the environment.

In this context, the Task Force began deliberations at its first meeting in February 2002, with the goal of completing deliberations and issuing findings and recommendations in June 2003.

3. Task Force Composition, Process, and Information Gathering

This section describes the Task Force and its process, including the Project Map developed by the group. It also describes information gathering and other support provided to the Task Force, including a summary of an evaluation of concerns about area-wide soil contamination.

Task Force Composition and Process

The Task Force is made up of 17 individuals who represent business, environmental interests, agriculture, local government, and schools. Task Force members were identified by the Agencies based on areas of expertise, ability to represent potentially affected stakeholder groups, and a desire to ensure wide geographic representation across the state. Task Force members served the project as volunteers—they were not compensated for their time or expertise. Most Task Force members served for the entire

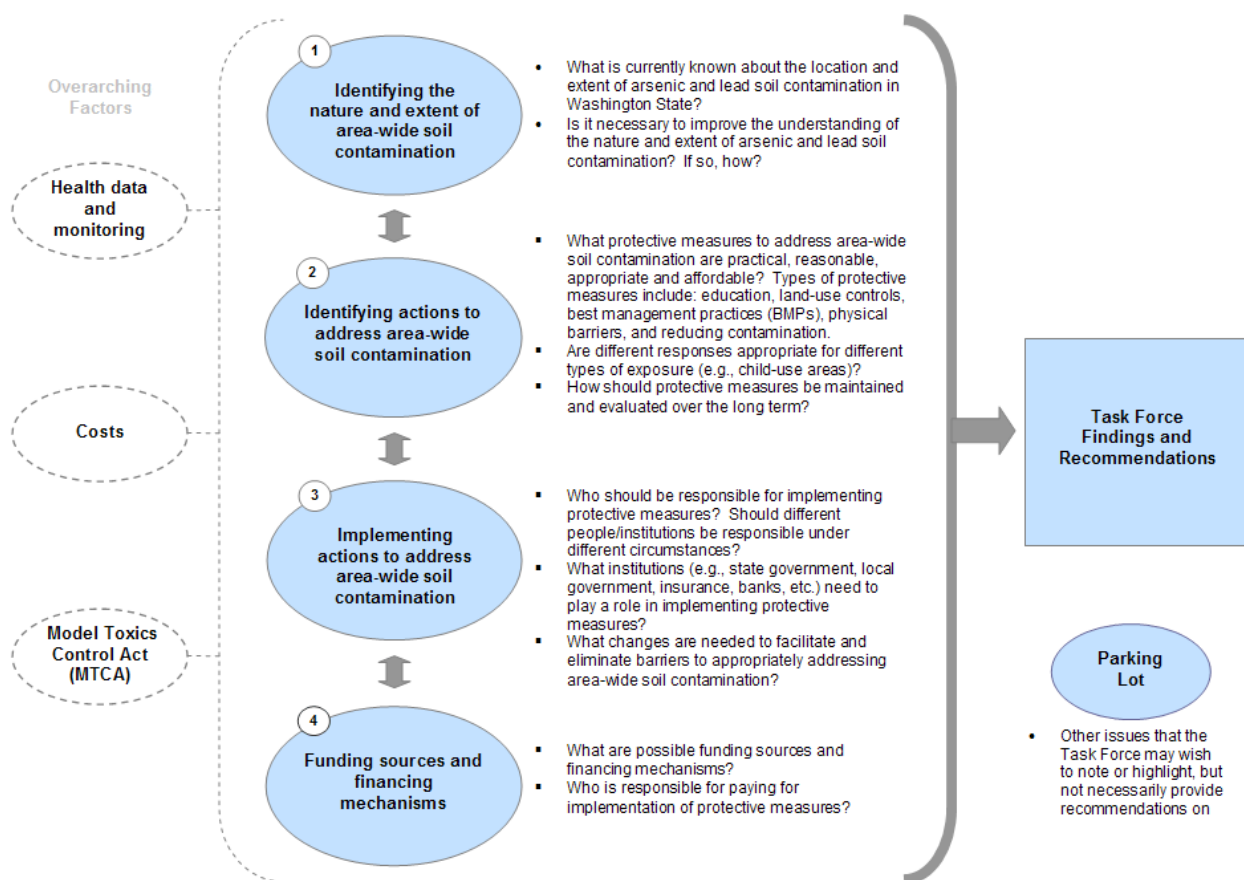
process. Two Task Force members left the process relatively early because of changes in their professional circumstances. They were replaced by other representatives in their area of expertise.

The Task Force held 12 meetings between January 2002 and June 2003. They began by reviewing and accepting the Task Force charter, which includes the questions posed by the Agencies and the areas identified as outside the scope of the Task Force deliberations discussed in the section above. They also selected two co-chairs—a representative of environmental interests from Western Washington and a representative of business interests from Eastern Washington—to guide and manage the Task Force process. A list of Task Force members, meeting locations and dates, and a copy of the Task Force charter are included in Appendix A.

There were a wide range of views on the Task Force, and at their first meetings Task Force members struggled to develop a common language and information base from which to discuss area-wide soil contamination issues and to understand one another's concerns and interests. At their fourth meeting, the Task Force developed the Project Map as a way to organize their deliberations. The Project Map organizes Task Force deliberations in four issue areas: identifying the nature and extent of area-wide soil contamination, identifying actions to address area-wide soil contamination, implementing actions to address area-wide soil contamination, and funding sources and financing mechanisms. It lists questions that the Task Force considered under each issue area and shows the issue areas as interrelated and informed by overarching factors such as cost and health-risk data.

The Project Map was used to frame all subsequent Task Force deliberations. In between full Task Force meetings, small groups of Task Force members met to evaluate specific issues identified on the Project Map and develop options and recommendations for the full Task Force to consider. The Project Map was used to organize and frame emerging areas of Task Force convergence and formed the basis for the specific Task Force recommendations described in this report.

Figure 1: Area-Wide Soil Contamination Project Map



The Task Force completed preliminary findings and recommendations for the majority of the questions on the Project Map in April 2003. Preliminary Task Force findings and recommendations were made available for public review and comment in May 2003 at five focused public meetings. Task Force members attended the public meetings to hear reactions to the preliminary findings and recommendations. The Task Force then met twice in June 2003 to evaluate public comments and refine their findings and recommendations, and issued their final report at the end of June 2003. The public review and comment process is summarized in Appendix B.

The Agencies served as ex officio members of the Task Force, attending both Task Force and small group meetings. They provided background information and support for Task Force deliberations and offered agency perspectives during the Task Force's development of findings and recommendations, but did not participate in final decision-making with respect to the Task Force report. In addition, the Task Force was supported by a contractor project team hired by Ecology and, early in their process, by two workgroups made up of technical experts and advisors. The workgroups carried out research and analysis

to support Task Force deliberations and also provided technical review and support for documents prepared in support of the Task Force. The contractor project team carried out research and analysis to support Task Force deliberations and provided a neutral third-party facilitator for Task Force and small group meetings.

Information Gathering to Support Task Force Deliberations

Task Force deliberations were informed by a broad-based information gathering effort that occurred early in the Task Force process. This information gathering effort had three components:

- Interviews with Task Force members and stakeholders to identify key issues and concerns.
- Survey research to identify and learn from other approaches to area-wide soil contamination and similar challenges.
- Case studies of several relevant cleanup or land-use development projects to evaluate their legal, funding, and institutional arrangements for addressing soil contamination and responding to public concerns.

Each of these efforts are described briefly below and summarized fully in appendices to this report.

Key Issues and Concerns

Over approximately six weeks, from late February through early April 2002, the contractor project team carried out 33 interviews with Task Force members and other stakeholders to identify the range of concerns about area-wide soil contamination and hopes for the Task Force deliberations. Each interview was approximately one hour in length and covered a variety of topics, ranging from the interviewee's knowledge of widespread arsenic and lead contamination in soil to the interviewee's thoughts on project outcomes and priorities. Although each interviewee was unique and a wide variety of concerns and hopes were expressed, there was remarkable commonality across interviews. In particular, most interviewees expressed the following:

- Concerns about risks to public health and to sensitive subpopulations (especially children) from arsenic and lead contamination, the ability of individuals to adequately understand and manage

health risks, and the ability of the charting Agencies to effectively communicate information on health.

- Concerns about the potential cost of actions to address area-wide soil contamination and the availability of funding for implementation of recommendations.
- Concern that, because area-wide arsenic and lead soil contamination is largely the result of historical sources, it is unfair to expect current residents to shoulder any cleanup burden, either through direct payment of cleanup costs or by suffering decreased property values as a result of concerns about cleanup liability.
- The need for the Task Force to develop effective recommendations that can be implemented in a reasonable fashion and the infeasibility of using traditional cleanup methods, such as soil removal, to address area-wide soil contamination.
- The need for effective, factual communication and public education on issues so that the project does not prompt undue public alarm or outcry.
- Concern that increased knowledge of widespread arsenic and lead contamination could have adverse economic impacts and depress property values—or have adverse affects on tourism, people moving to potentially affected areas, or business development—and the need to manage the project in a way that avoids such adverse effects.
- Concern that increased knowledge of widespread arsenic and lead contamination could have adverse implications for agriculture and sustainability of agriculture market and land values, and the need to protect these values and markets.

Interviewees also expressed a desire that the Task Force develop recommendations through consensus, establish a range of practical solutions that can be applied statewide but also adapted to meet local conditions and needs, and develop recommendations that are implementable, reasonable, useful, and appropriate solutions for the problem.

Although many common issues were identified, there still was a wide range of views among interviewees. For example, while virtually all interviewees were concerned about the adverse health risks posed by

arsenic and lead in soil, some interviewees were very concerned about potential health risks from arsenic and lead soil contamination particularly for children. Other interviewees were less convinced that low-to-moderate arsenic and lead contamination in soil posed a true health risk, particularly compared to other potential health risks, and were more concerned that any actual risk be communicated carefully in a way that does not alarm parents. Still other interviewees were concerned not only about health risks, but also about risks to ecological receptors and to pets. Over the life of the project, in particular for Task Force members, concerns about area-wide soil contamination and hopes for the process outcomes were addressed as a result of increased understanding and the collaborative process. Nonetheless, the initial interviews served as a touchstone throughout the process and focused Task Force deliberations and recommendations. The details of the interview process and results are summarized fully in Appendix C.

Information Survey

In January through April 2002, the contractor project team conducted over 20 phone interviews and researched over 200 documents relevant to improving understanding of area-wide soil contamination sources and the geographic extent of contamination, identifying feasible measures to protect the health of people who live or work on or near area-wide soil contamination, and identifying current laws, regulations, land-use planning processes, and other institutional frameworks and new initiatives to address area-wide soil contamination or similar threats.

Numerous other localities have considered and addressed issues associated with historical smelter emissions or historical pesticide contamination. The experiences of other places around the world that have considered and addressed area-wide soil contamination or have struggled to meet similar challenges enriched Task Force deliberations. The survey is described fully in Appendix D.

Case Studies

Based on the information survey, the Task Force identified five case studies for more in-depth evaluation, as follows.

- Cleanup and redevelopment into residential areas of the Verdese Carter Park area in Oakland, California. Verdese Carter Park was contaminated with arsenic and lead from historical smelter emissions and other sources.

- Emergency responses, removal, and remedial actions at Barber Orchard in Haywood County, North Carolina: a 500-acre former apple orchard contaminated by historical use of lead arsenate and other pesticides and subdivided for residential development in the late 1980s.
- Cleanup of the Bunker Hill Superfund Site in Idaho, a former metal smelting and mining facility at which response measures, including institutional controls, have been in place since 1995.
- The Lowell, Massachusetts Brownfields Redevelopment efforts, which have combined a wide variety of loans, grants, and other resources to address numerous sites contaminated by historical industrial uses.
- The New Jersey Historical Pesticide Contamination Task Force and Mount Laurel Township, New Jersey, which has established local ordinances requiring soil testing and cleanup prior to development of formerly agricultural lands.

The case study evaluations allowed the Task Force to become familiar with a number of specific cleanup actions, with a focus on the institutional approaches used to compel, encourage, oversee, and fund responses. The case studies are included as Appendix E.

4. Nature and Extent of Area-Wide Soil Contamination

As part of its charge, the Task Force considered what is known and not known about the location and magnitude of elevated levels of arsenic and lead in soil due to three historical sources: smelter emissions, pesticides containing arsenic and lead, and past use of leaded gasoline. Much of the Task Force's deliberations about the nature and extent of area-wide soil contamination focused on how this information should be communicated in a way that would accurately present information but not cause individuals to be unduly alarmed. As discussed below, the Task Force decided that a tiered series of maps, along with accompanying information and tools, should be used to communicate information on the nature and extent of area-wide arsenic and lead soil contamination in a balanced and useful way. The Task Force also identified two areas where improvements in understanding of the nature and extent of area-wide soil contamination are necessary: developing local maps to area-wide soil contamination where such maps do not already exist (primarily for areas affected by lead arsenate pesticides) and collecting data on the

distribution and magnitude of area-wide soil contamination from past use of leaded gasoline, particularly in areas where children may be exposed.

The Task Force's findings and recommendations in this section are organized according to three questions the Task Force considered:

- *What is currently known about the nature and extent of arsenic and lead soil contamination in Washington State?*
- *How should information on the nature and extent of area-wide soil contamination be communicated?*
- *What steps should be taken to improve our understanding of the nature and extent of arsenic and lead soil contamination?*

What is Known about the Nature and Extent of Area-Wide Arsenic and Lead Soil Contamination?

Elevated levels of arsenic and lead are present in soil in some areas of Washington State from a number of historical sources, primarily metal smelters, lead arsenate pesticides, and emissions from the past use of leaded gasoline. In areas affected by smelter emissions and areas where lead arsenate pesticides were applied to crops, concentrations of arsenic and lead in soil generally are higher than concentrations that occur naturally in Washington soils and higher than state soil cleanup levels established under the Model Toxics Control Act; however, concentrations generally are lower than those found at smelter operation sites and in areas where lead arsenate pesticides were mixed and formulated. Low-to-moderate arsenic and lead soil contamination associated with areas affected by smelter emissions, areas where lead arsenate pesticides were applied to crops, and past use of leaded gasoline is referred to as “area-wide soil contamination” to distinguish it from contamination at more traditional hazardous substance cleanup sites.

What Are Other Sources of Arsenic and Lead Contamination?

Based on studies prepared to support Task Force deliberations, historical smelter emissions, historical use of lead arsenate pesticides, and historical use of leaded gasoline are believed to be the most widespread sources of arsenic and lead soil contamination in soil in Washington State. They are not the only potential sources of lead and arsenic in the environment. Lead and arsenic occur naturally in the environment at varying concentrations in air, soil, rocks, surface water, and ground water. Other sources of arsenic contamination include wood treated with chromated copper arsenic (often called “pressure-treated” wood), emissions from coal-fired power plants and incinerators, industrial processes, and fish and shellfish. Other sources of lead contamination include lead-based paint, lead-soldered water pipes, home remedies or health-care products that contain lead, hobbies that use lead (e.g., staining glass or sculpturing), foods and beverages, combustion of coal or oil, waste incinerators, and mining and industrial processes (such as battery and ammunitions manufacturing). Many of these other sources of arsenic and lead contamination were discussed by the Task Force and one mentioned in this report. For example, the use of home remedies containing lead is addressed in a Task Force letter wrote to the Agencies recommending that more data be gathered on the health of Washington residents, including information on whether use of home remedies constituted a significant source of lead. Ultimately, the Task Force focused its deliberations on widespread arsenic and lead soil contamination from the three historical sources identified above.

The precise boundaries of land affected by area-wide soil contamination are not defined; however, certain places have a higher likelihood of arsenic and lead soil contamination based on the locations of metal smelters or the estimated use of lead arsenate pesticides from approximately 1905 to 1947. To support Task Force deliberations, the contractor project team conducted a detailed study of available data on the nature and extent of area-wide soil contamination. Based on this study, areas affected by smelter emissions in King, Pierce, Snohomish, and Stevens counties were determined to have a higher likelihood of arsenic and lead soil contamination based on historical emissions of metal smelters located in Tacoma, Harbor Island, Everett, Northport, and Trail, BC. Areas where apples and pears were historically grown were determined to have a higher likelihood of arsenic and lead soil contamination based on historical use of lead arsenate pesticides. Chelan, Spokane, Yakima, and Okanogan counties have a higher likelihood than other counties for elevated levels of lead and arsenic in soil based on the higher numbers of apple and pear trees in production there between 1905 and 1947. The full extent of area-wide soil contamination from past use of leaded gasoline in Washington is not known; however, in general, land adjacent to any road constructed prior to 1995 has some likelihood of elevated levels of lead in soil from leaded gasoline. (Recommendations for additional research on roadside lead contamination are discussed below.) The following table describes the number of acres potentially affected by smelter emissions and historical uses of lead arsenate pesticides.

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Table 1: Preliminary Estimates of Area-Wide Soil Contamination in Washington

Area-Wide Contamination Source	Estimated Land Area Affected ⁽³⁾
Smelters	
<i>Tacoma</i>	329,600 acres ⁽¹⁾
<i>Everett</i>	8,320 acres ^{(1) (2)}
<i>Harbor Island</i>	640 acres ⁽¹⁾
<i>Northport and Trail</i>	150,400 acres ^{(1) (2)}
Orchard Land	187,590 acres ⁽¹⁾
Roadsides	Cannot be estimated
All Area-Wide Sources	>676,550 acres

⁽¹⁾ Extent of affected area has not been fully characterized.

⁽²⁾ Based on air modeling for the Everett smelter and maps of sulfur dioxide injury to vegetation for the Northport and Trail smelters.

⁽³⁾ The total area of land in Washington is 66,544 square miles, or about 42.6 million acres.

According to the study prepared to support Task Force deliberations, the range of concentrations of arsenic and lead in soil in area-wide soil contamination areas is quite broad. Arsenic concentrations range from natural background levels, which average 7 milligrams/kilogram (mg/kg) statewide, to over 400 mg/kg for most soil samples (with some soil samples as high as 3,000 mg/kg) in smelter areas and as high as 639 mg/kg in shallow orchard soils. Lead concentrations range from natural background levels, which average 17 mg/kg statewide, to over 1,000 mg/kg for most soil samples (with some soil samples as high as 3,000 mg/kg) in smelter areas and up to 3,200 mg/kg in shallow orchard soils. By comparison, the MTCA cleanup levels for arsenic and lead are 20 mg/kg and 250 mg/kg, respectively. Soil concentrations tend to be higher around the Tacoma smelter than in the other smelter areas, because the Tacoma smelter operated for a longer period. Concentrations of arsenic and lead at properties affected by area-wide soil contamination are highly variable and depend on the historical use and development of the property. For example, soils are often mixed and redistributed during the development of a property; this disturbance tends to dilute the concentrations of arsenic and lead in soil. Because of this variability, concentrations on one property cannot reliably be used to predict concentrations on neighboring properties. Where found, arsenic and lead soil contamination tends to be relatively shallow. In undisturbed soils, most of the arsenic and lead from historical smelter emissions and historical use of lead-arsenate pesticides is concentrated in the upper 6 to 18 inches of soil.¹

¹ Data in this paragraph from Landau Associates, *Preliminary Estimates Report, Area-Wide Soil Contamination Strategy, Washington State*, prepared for the Washington State Department of Ecology, Olympia, WA, 2003 (pending).

Information on the nature and extent of arsenic and lead soil contamination formed the basis for Task Force discussions about how to communicate what is known about area-wide soil contamination. It also informed Task Force deliberations on what actions should be taken to respond to area-wide soil contamination in important ways. For example, the understanding that arsenic and lead soil contamination tends to remain in surface soils indicates that ground water contamination is not likely an issue for properties affected by area-wide soil contamination. Similarly, the understanding that arsenic and lead contamination tends to be greatest in undisturbed soils informed the Task Force's recommendations on additional steps that should be taken to address conversions of open space into developed properties.

Recommendations on How Information on the Nature and Extent of Area-Wide Soil Contamination Should Be Communicated

The Task Force recommends that information on the nature and extent of area-wide soil contamination be communicated using a combination of maps and accompanying narrative information. Maps are a highly effective way to communicate available information about potential locations of area-wide soil contamination to the public. Besides communicating information about potential locations of area-wide soil contamination to the public, the maps recommended by the Task Force serve a variety of purposes, including informing the Agencies' identification of areas where an alternate approach to MTCA would apply (see Section 9 below) and helping the Agencies and local jurisdictions prioritize and focus efforts to address area-wide soil contamination on areas where soil contamination is likely. Particularly for the Tacoma and Everett smelter areas, mapping of where area-wide soil contamination is most likely to be found has been under way for a number of years as part of the ongoing cleanup efforts for these sites. For both the Tacoma and Everett smelters, Ecology, several local jurisdictions, and other organizations have and continue to collect data on where arsenic and lead soil contamination is likely to be present based on emissions, wind deposition, and a number of soil sampling events, and have developed maps to communicate this information. These maps were an important factor in the Task Force deliberations.

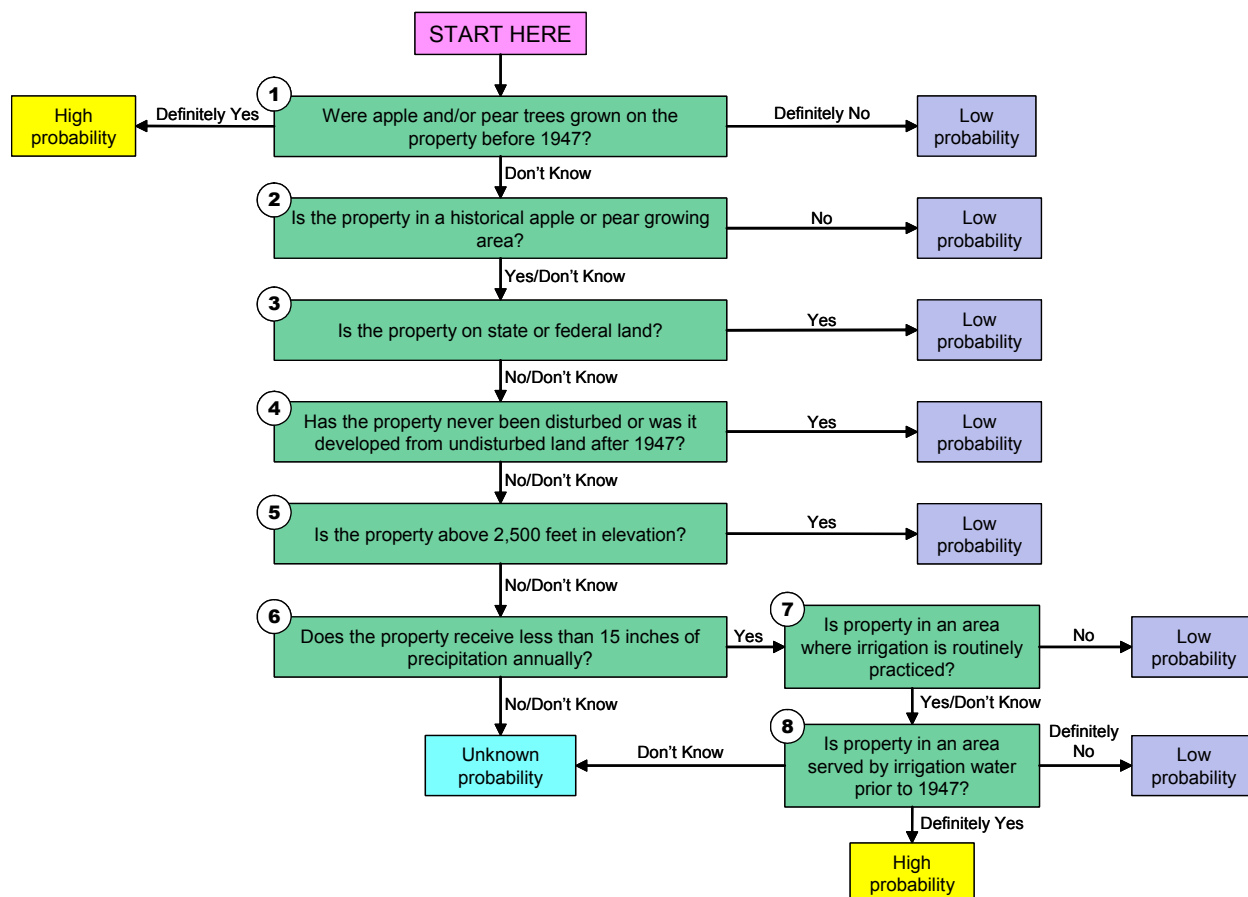
Although maps are important, the Task Force believes strongly that they are not the only method needed to communicate information about area-wide soil contamination. As discussed above, the precise boundaries of area-wide soil contamination are not, and likely will not be, defined using maps. Even within identified area-wide soil contamination locations actual levels of arsenic and lead in soil and contaminant concentrations vary greatly. Because of this, the Task Force emphasizes that maps can only

be used to communicate where elevated levels of arsenic and lead in soil are more likely relative to other areas in Washington State. Maps do not show where elevated levels of arsenic and lead have actually been found and many properties within identified area-wide soil contamination locations will, if sampled, likely be shown to be free of arsenic and lead. For this reason, maps must be accompanied by information to describe what the map illustrates and to provide additional context for the area-wide soil contamination issue. The Task Force emphasizes that it believes it would be irresponsible for the Agencies or local jurisdictions to release maps of area-wide soil contamination without adequate accompanying explanations and contextual information. As discussed in greater detail in Section 6 below, information accompanying maps in the toolbox should, among other things, describe the variability of the nature and extent of area-wide soil contamination, provide guidance on how to conduct evaluations of individual properties, describe actions individuals can take to reduce potential exposure to contaminated soil, and provide contact information for organizations and individuals who can answer questions and provide additional assistance.

The Task Force recommends two tiers of maps and accompanying information.

- Tier 1: The first tier of maps and accompanying information should identify the general areas in the state where elevated levels of arsenic and lead soil contamination are more likely to be present based on historical smelter emissions and historical use of lead arsenate pesticides. Tier 1 accompanying information should emphasize that maps do not show areas that have been found to be contaminated, but simply show where contamination is more likely relative to other places. Tier 1 information should be designed to raise awareness about area-wide soil contamination in the widest possible audience and to help users decide whether to look at the second tier of more detailed maps and informational tools for more information.
- Tier 2: The second tier of maps and accompanying information should identify where area-wide soil contamination is likely to be present shown on more detailed, smaller scale maps of smelter plumes and historical orchard areas, where these areas are known. Tier 2 accompanying information should include flow charts and/or other informational tools to help individuals determine whether arsenic and lead soil contamination are likely to be present based on the location and land use history of individual properties (see the lead arsenate flowchart included as Figure 2), and to determine whether implementation of individual protection measures or other responses, including soil sampling, are appropriate.

Figure 2: Lead Arsenate Pesticide Contamination Flowchart



Smelter Maps

The Task Force recommends that the Agencies rely on the following maps showing areas affected by historical smelter emissions.

- Tier 1: Figure 3 shows the general locations of areas affected by historical smelter emissions in Washington, based on information currently available.
- Tier 2: Figures 4–7 are smaller scale maps of areas affected by individual smelters.

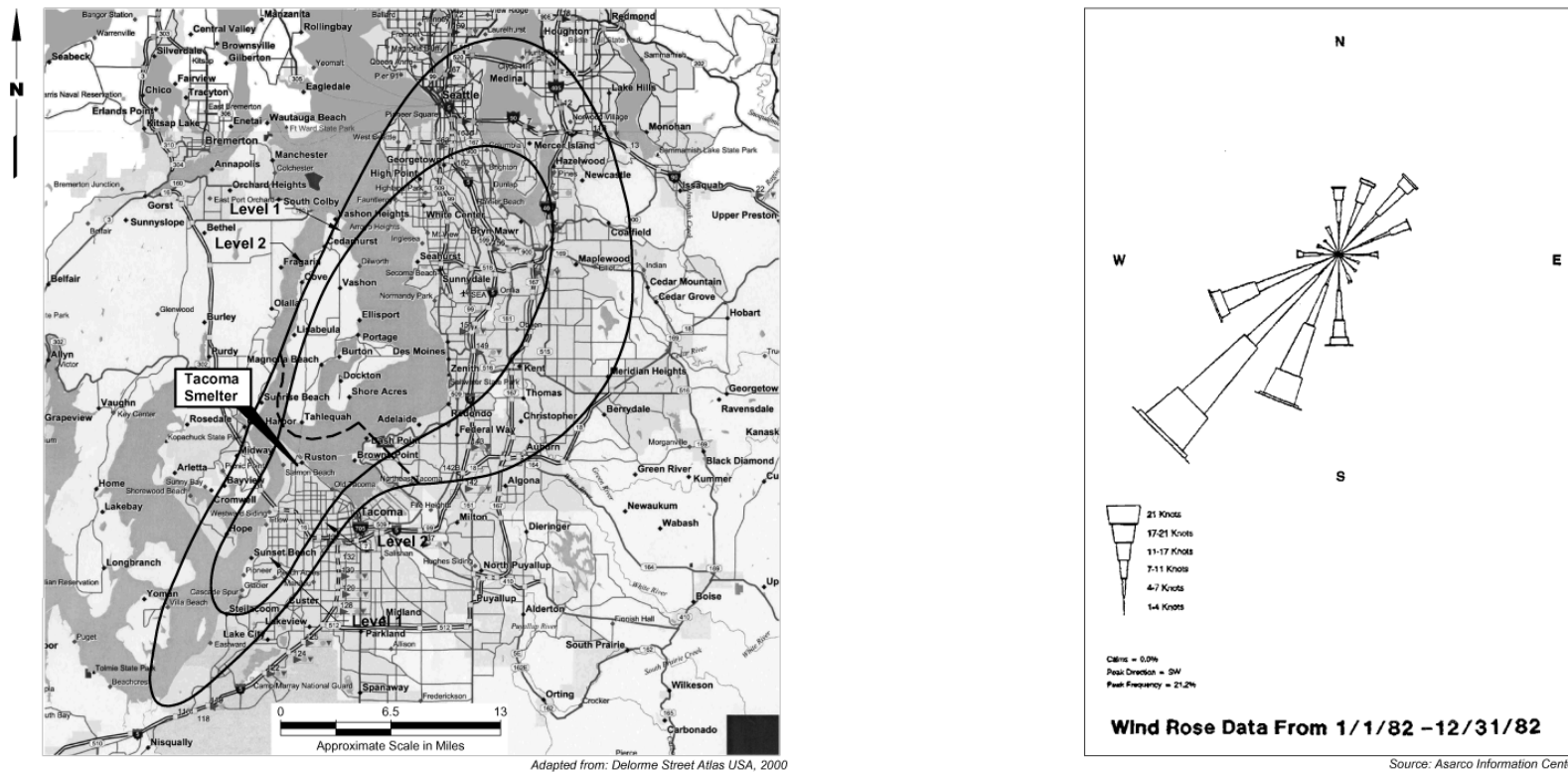
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Figure 3: Areas Potentially Affected by Historical Smelter Emissions, Based on Data Available as of January 2003



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Figure 4: Map of the Area Affected by Emissions from the Tacoma Smelter with Wind Rose Diagram of Predominant Wind Directions at the Smelter Site, Based on Data Available as of January 2003



Legend

Level 1: Area Where Shallow Undisturbed Soil Likely Exceeds 20 mg/kg Arsenic

Level 2: Area Where Shallow Undisturbed Soil Occasionally Exceeds 20 mg/kg Arsenic

Data Sources:
Ecology, 2002
Glass, 2002

Interpreting a Wind Rose

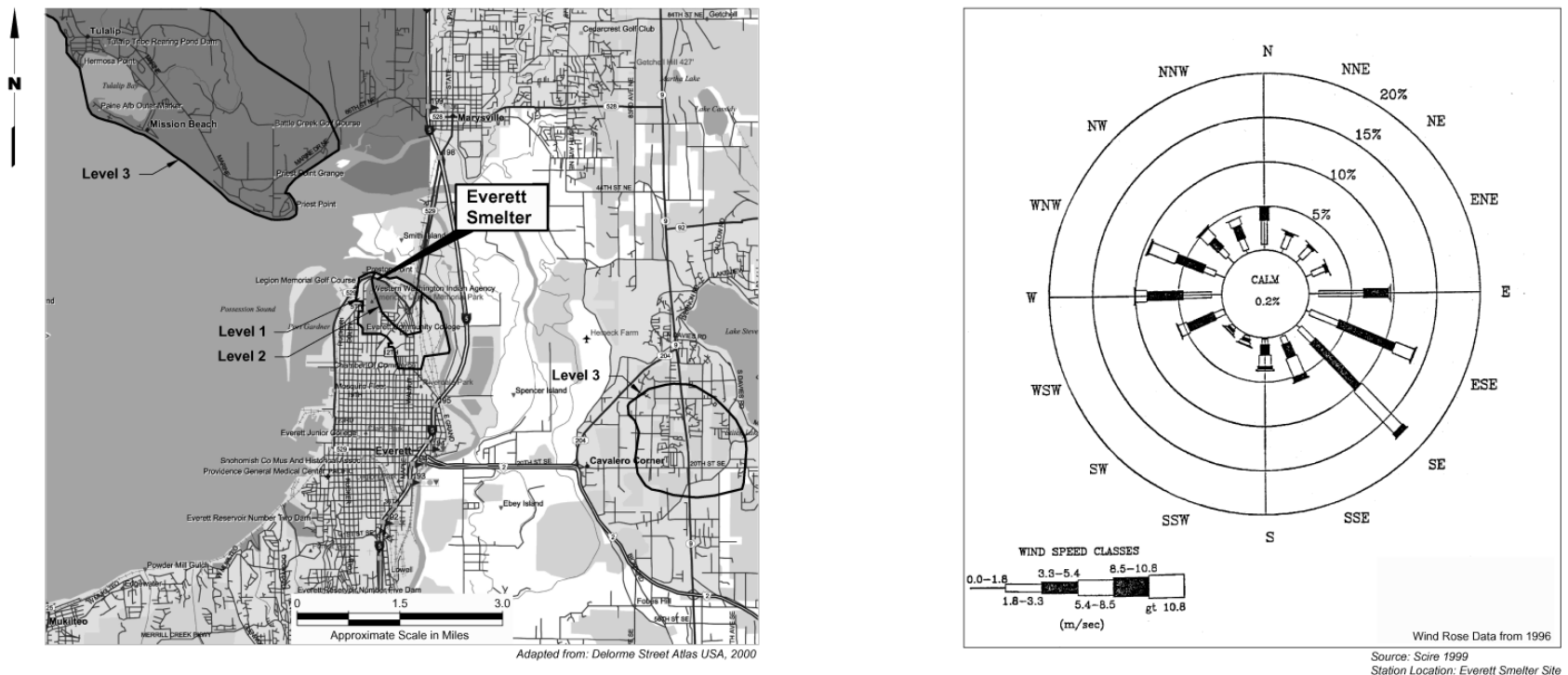
A wind rose is a quantitative graphical summary of the wind direction and speed for a given time. The wind rose graph shows the number of hours (expressed as a percentage) that the wind blew from a particular direction and speed. The wind rose spokes or arms represent 16 points of the compass and are labeled by wind direction. The percentage of time the wind blew from a given direction is expressed by percentage for that direction on the perimeter of each rose. The length of each segment of a spoke represents the percentage of time the wind speed was within a specific speed interval for a particular direction (the longer the spoke, the greater the time that the wind blew from that direction). If summed for all wind directions, the result would provide the percentage of all hours the wind speed was measured within a specific interval. The percentage of time when the winds were light and variable is shown in the center of the rose.

Disclaimer

The map of the area affected by smelter emissions was originally developed in 2003 for the Landau Associates report "Preliminary Estimates, Area-wide Contamination Strategy, Washington State". They are based on information available at that time and are intended to provide a general indication of where elevated levels of arsenic and lead in soil may be present due to historical smelter emissions, so individuals and communities can assess whether to look into additional information on area-wide soil contamination. Additional information on area-wide soil contamination, including information on actions individuals can take to better understand the potential for elevated levels of arsenic and lead at individual properties and to minimize the potential that they will be exposed to arsenic and lead, is available at www.asarco.com.
Not all of the areas identified on the map will actually have elevated levels of arsenic and lead in soil. This map should not substitute for a site-specific assessment.

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Figure 5: Map of the Area Affected by Emissions from the Everett Smelter with Wind Rose Diagram of Predominant Wind Directions at the Smelter Site, Based on Data Available as of January 2003



Legend

Level 1: Area Where Shallow Soil Likely Exceeds 20 mg/kg Arsenic

Level 2: Area Where Shallow Soil Occasionally Exceeds 20 mg/kg Arsenic

Level 3: Area Where Modeling Predicted Most Likely Particulate Deposition From Former Furnace Stack

Data Sources:
Ecology, 1999
Scire, 1999

Interpreting a Wind Rose

A wind rose is a quantitative graphical summary of the wind direction and speed for a given time. The wind rose graph shows the number of hours (expressed as a percentage) that the wind blew from a particular direction and speed. The wind rose spokes or arms represent 16 points of the compass and are labeled by wind direction. The percentage of time the wind blew from a given direction is expressed by percentage for that direction on the perimeter of each rose. The length of each segment of a spoke represents the percentage of time the wind speed was within a specific speed interval for a particular direction (the longer the spoke, the greater the time that the wind blew from that direction). If summed for all wind directions, the result would provide the percentage of all hours the wind speed was measured within a specific interval. The percentage of time when the winds were light and variable is shown in the center of the rose.

Disclaimer

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Not all of the areas identified on the map will actually have elevated levels of arsenic and lead in soil. This map should not substitute for a site-specific assessment.

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Figure 6: Map of the Area Affected by Emissions from the Harbor Island Smelter with Wind Rose Diagram of Predominant Wind Directions at the Smelter Site, Based on Data Available as of January 2003



Legend

Level 1: Area Where
Shallow Soil Likely
Exceeds 250 mg/kg
Lead

Data Source:
Weston, 1993

Interpreting a Wind Rose

A wind rose is a quantitative graphical summary of the wind direction and speed for a given time. The wind rose graph shows the number of hours (expressed as a percentage) that the wind blew from a particular direction and speed. The wind rose spokes or arms represent 16 points of the compass and are labeled by wind direction. The percentage of time the wind blew from a given direction is expressed by percentage for that direction on the perimeter of each rose. The length of each segment of a spoke represents the percentage of time the wind speed was within a specific speed interval for a particular direction (the longer the spoke, the greater the time that the wind blew from that direction). If summed for all wind directions, the result would provide the percentage of all hours the wind speed was measured within a specific interval. The percentage of time when the winds were light and variable is shown in the center of the rose.

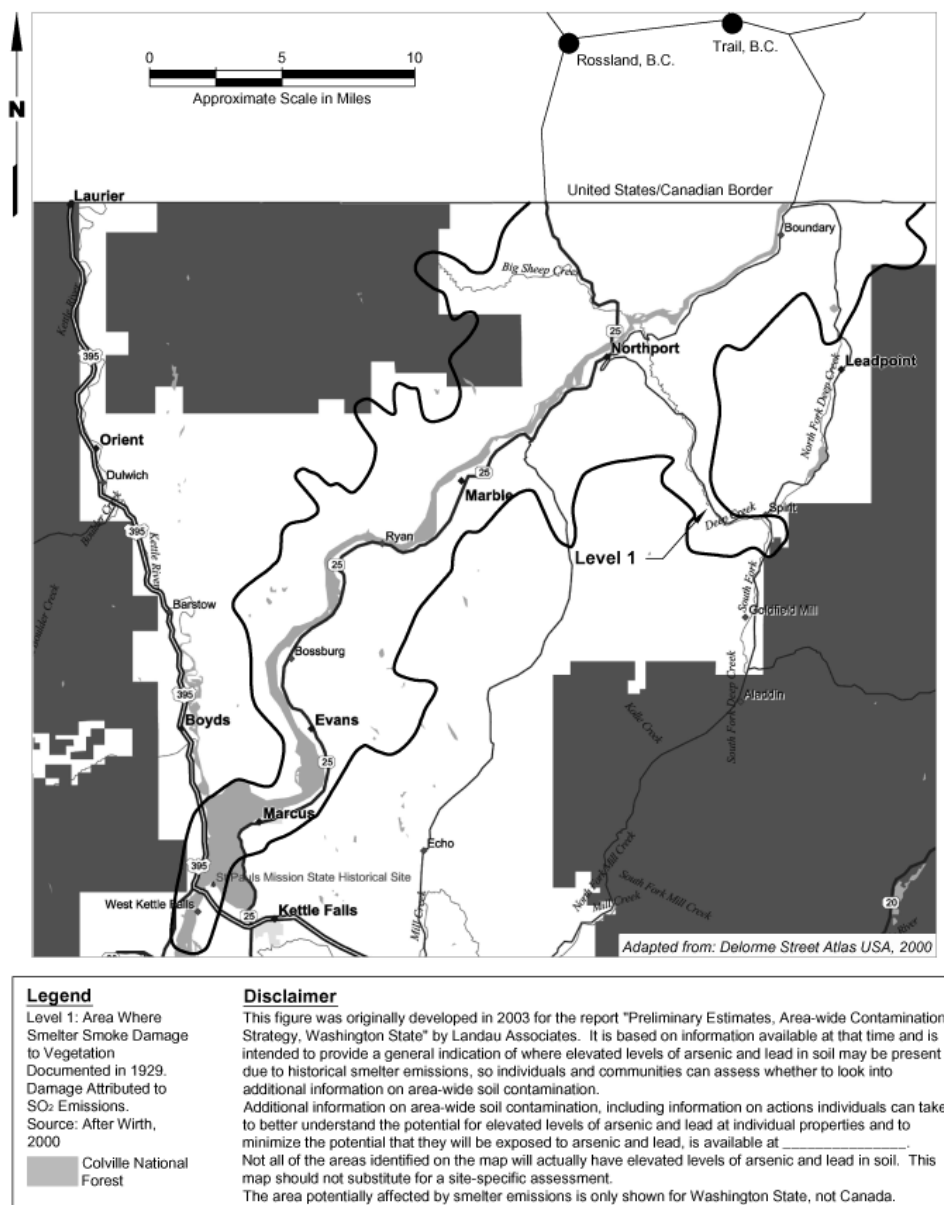
Disclaimer

The map of the area affected by smelter emissions was originally developed in 2003 for the Landau Associates report "Preliminary Estimates, Area-wide Contamination Strategy, Washington State". They are based on information available at that time and are intended to provide a general indication of where elevated levels of arsenic and lead in soil may be present due to historical smelter emissions, so individuals and communities can assess whether to look into additional information on area-wide soil contamination. Additional information on area-wide soil contamination, including information on actions individuals can take to better understand the potential for elevated levels of arsenic and lead at individual properties and to minimize the potential that they will be exposed to arsenic and lead, is available at [http://www.wa.gov/health/contamination/](#).

Not all of the areas identified on the map will actually have elevated levels of arsenic and lead in soil. This map should not substitute for a site-specific assessment.

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Figure 7: Map of the Area Affected by Emissions from the Northport and Trail, BC Smelters, Based on Data Available as of January 2003



Lead Arsenate Pesticide Maps

The location of areas affected by historical use of arsenical pesticides is not as well known or as extensively studied as areas affected by historical smelter emissions in Washington. Because of this difference, the Task Force recommends a slightly different mapping strategy.

- First, the Task Force recommends that the Agencies use Figure 8, which shows the total acreage of land potentially affected by lead arsenate pesticide use in each county, as a Tier 1 state map for

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lead arsenate pesticide contamination. Note that the Task Force considered many options for this map and attempted to develop Tier 1 maps for historical uses of lead arsenate pesticides that more closely resemble the Tier 1 maps for historical smelter emissions. As a result of these efforts, the Task Force concluded that at this time, data were not available to develop a state lead arsenate pesticide map comparable to the Tier 1 state smelter map.

Figure 8: County Acreage Potentially Affected by Historical Use of Lead Arsenate Pesticide



- Second, the Task Force recommends that the state map be supplemented by two types of smaller scale maps:
 - Tier 1 maps of the general locations of areas potentially affected by lead arsenate contamination within individual counties, based on readily available land use information. The Task Force developed examples of these maps for Chelan, Okanogan, and Yakima counties (see Figures 9–11). These maps show areas that are below 2,500 feet in elevation and are not state and Federal public lands. Fruit trees are not likely to have been grown on state and Federal public lands, or at elevations greater than 2,500 feet (based the highest elevation of historical orchard locations in Yakima and Chelan counties).

Figure 9: Areas Potentially Affected by Historical Use of Lead Arsenate Pesticide in Chelan County

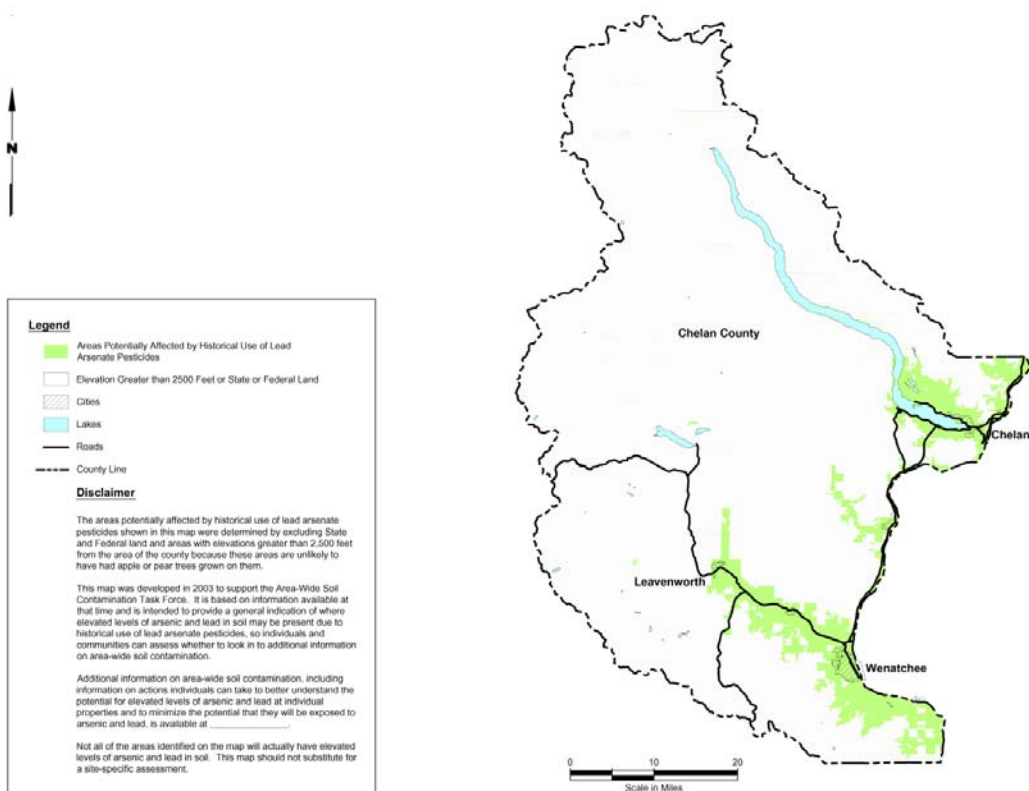


Figure 10: Areas Potentially Affected by Historical Use of Lead Arsenate Pesticide in Okanogan County

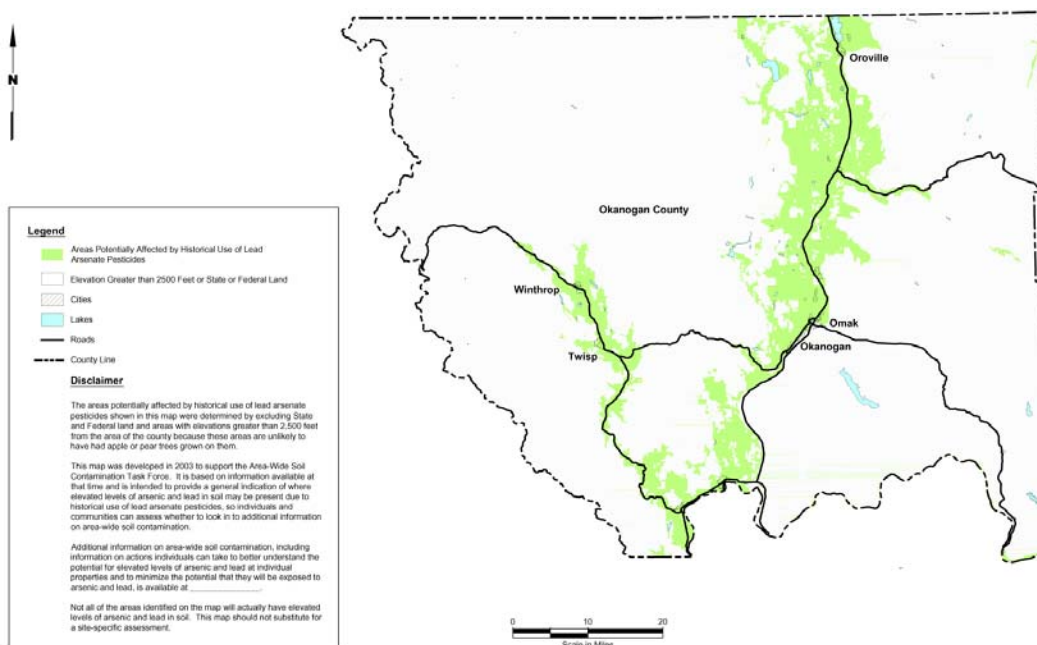
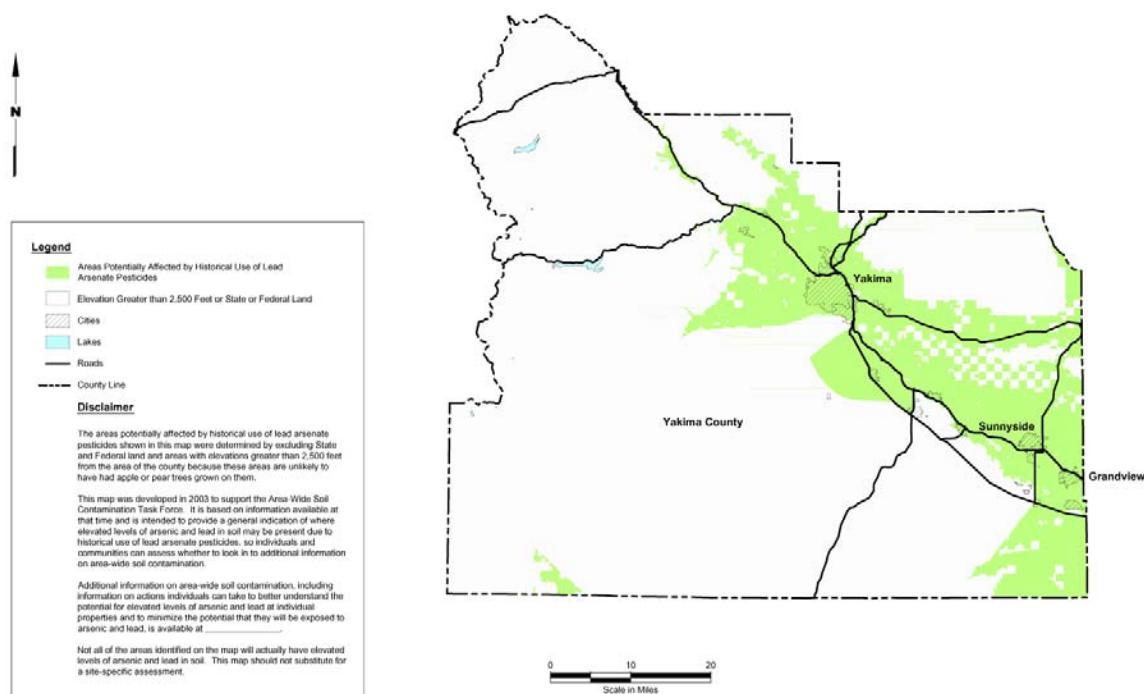


Figure 11: Areas Potentially Affected by Historical Use of Lead Arsenate Pesticide in Yakima County



- Tier 2 maps showing the locations of historical orchards. Maps of historical orchards in Yakima county and in the Manson area near Lake Chelan are included in this report (see Figures 12–13) as examples of Tier 2 lead arsenate maps that the Task Force believes useful. These maps were developed by analyzing 1947 aerial photographs to identify the locations of historical orchards, entering this information into a geographic information system (GIS) database, and overlaying the locations of the historical orchards onto aerial photographs (for Manson) or other geographic data, such city and county boundaries, and highways (for Yakima County).

It is important to reiterate that while maps show a greater or lesser probability of encountering elevated levels of arsenic and lead soil contamination based on proximity to historical sources, but individual property evaluations are needed to determine whether elevated levels of arsenic and lead are actually present. Due to the variability of the nature and distribution of area-wide soil contamination, properties outside of areas identified on maps may contain elevated levels of arsenic and lead, while properties inside areas identified on maps may not, in fact, have elevated levels of arsenic and lead. The maps in

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this report include disclaimers to explain these limitations so that individuals are not given a false sense of assurance or concern about whether their property likely is affected by area-wide soil contamination.

Figure 12: Example Map of Historical Orchards in Yakima County

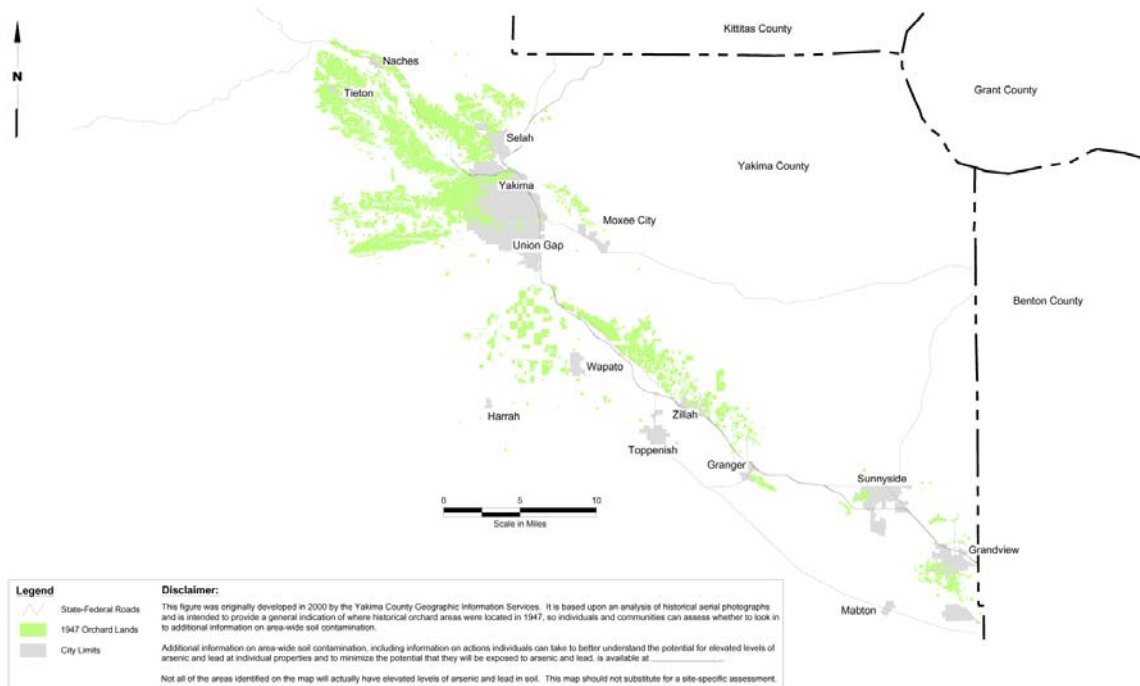
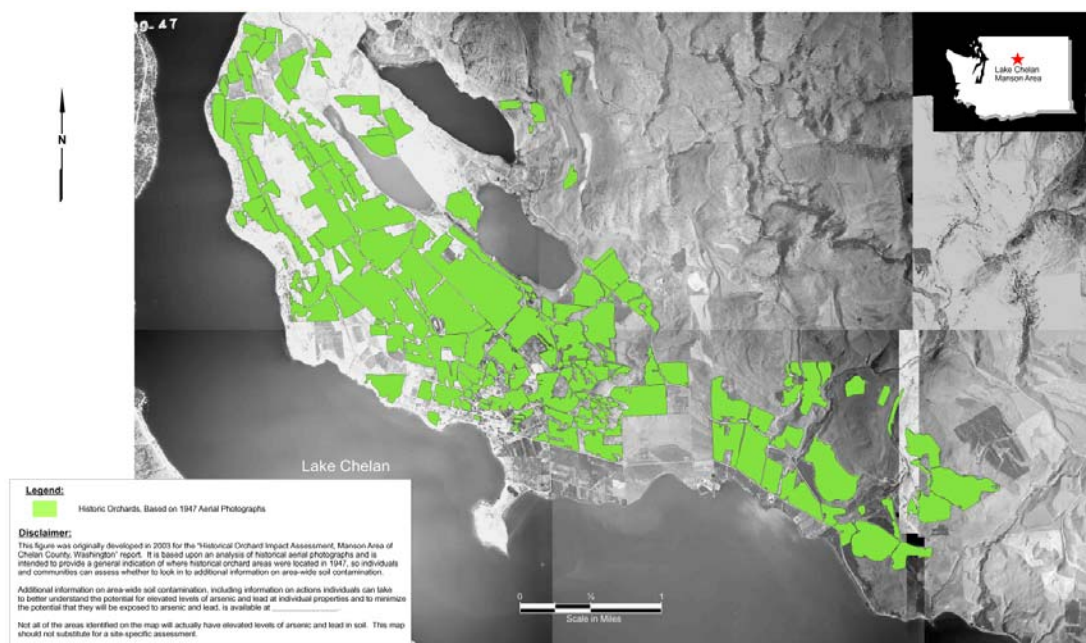


Figure 13: Example Map of Historical Orchards in the Lake Chelan/Manson Area of Chelan County



Recommendations for Improving Our Understanding of the Nature and Extent of Area-Wide Soil Contamination in Washington

The Task Force has two types of recommendations for improving understanding of the nature and extent of area-wide soil contamination: recommendations that address developing and updating maps and recommendations for additional study of roadside lead contamination.

Developing and Updating Maps

The Task Force has four recommendations for developing and updating maps of area-wide soil contamination areas:

- The maps produced to support Task Force deliberations (many of which were based on preexisting maps developed to support ongoing cleanup efforts associated with the Tacoma and Everett smelters) represent an important investment and should be used as the starting place for further mapping efforts, including efforts to identify areas that are eligible for the alternative approach under MTCA discussed in Section 9 of this Report.
- The Agencies should use their statewide GIS capability to maintain and update state maps of area-wide soil contamination areas.
- The Agencies should encourage, support, and provide financial assistance to local governments for the identification of historical orchard locations and, if appropriate, for the development of smaller scale maps of areas potentially affected by lead arsenate pesticide contamination. Depending on available data sources and local needs, these smaller scale maps may show general areas potentially affected by lead arsenate, based on land use information (such as the maps for Chelan, Okanogan, and Yakima counties), and/or may more specifically show historical orchard locations (such as the maps developed using historical aerial photographs for Yakima county and the Manson area near Lake Chelan).
- The Agencies should coordinate with local governments to maintain and update smaller scale maps of areas potentially affected by historical smelter emissions and areas potentially affected by lead arsenate pesticides. These maps should be updated regularly based on newly available information.

The Agencies and local governments should share responsibility for developing new maps of area-wide soil contamination and for updating existing maps based on newly available information. Because the areas potential affected by historical smelter emissions are already relatively well defined, the highest priority for funding efforts to refine understanding of the nature and extent of area-wide soil contamination should be to encourage, support, and provide financial assistance to local governments to identify historical orchard locations. In order to use financial resources most effectively, the Agencies should consider first providing “seed” money to local jurisdictions to research available data sources to determine the most appropriate means of identifying historical orchard locations and to develop smaller scale maps prior to providing full funding for map development. Financial resources should be made uniformly available to local governments for map development.

Additional Research on Roadside Lead Contamination

According to the study prepared by the contractor project team to support Task Force deliberations, little is known about the distribution of this contamination in Washington or the concentrations of lead that are likely to be present in soil in contaminated areas. Because roadside lead contamination may be extensive and may be found in many areas routinely used by people, including children (such as along side driveways and residential streets), the Task Force is troubled by this lack of information and understanding. The Task Force recommends that the Agencies conduct further research to characterize the location and extent of elevated levels of lead in soil from past use of leaded gasoline in Washington. Since children are most susceptible to lead contamination, this research should be focused in areas where there is the greatest potential for exposure of children and where concentrations are likely to be the greatest, such as areas adjacent to older, more heavily used roads. Depending on the results of this research, the Task Force recommends that the Agencies extend the recommendations discussed below for broad-based education and awareness building and responses to area-wide soil contamination to areas that are most likely to be affected by contamination from past use of leaded gasoline.

5. Approach to Evaluating Protection measures and Making Recommendations

This section describes the Task Force’s deliberations about what types of actions should be taken to respond to area-wide soil contamination. It includes descriptions of the information the Task Force considered on the potential risks associated with arsenic and lead in soil, the guiding principles the Task

Force developed to frame their more specific recommendations, and the full range of protection measures considered.

There is extensive scientific information demonstrating that exposure to high levels of arsenic and lead can cause health problems in people. Arsenic can cause more than 30 distinct health effects, including nervous system damage, increased blood pressure, heart attack, stroke, and cancer of the bladder, lung, skin, and other organs. Lead can affect many parts of the body, causing health effects that include increased blood pressure, kidney damage, and brain damage. Although both children and adults can be adversely affected by lead poisoning, it is a particular concern for young children. Parents may be familiar with public health programs designed to reduce the likelihood of childhood blood lead poisoning from exposures to residues from lead-based paint. Arsenic and lead are both considered persistent contaminants. This means that they bind strongly to soil and usually remain in the environment without breaking down or losing their toxicity, and can be a source of exposure for many decades.

Although the health risks associated with exposures to high levels of arsenic and lead are generally agreed upon by scientists, the health risks associated with exposure to low-to-moderate arsenic and lead soil contamination are less well understood and wide disagreements exist between scientists on the interpretation of available scientific information. For example, some members of the scientific community have argued that federal and state efforts to address historic contamination are not scientifically justified because there is no information demonstrating that health problems are being caused by exposure to low-to-moderate arsenic and lead soil contamination. Other members of the scientific community strongly believe that arsenic and lead have the potential to cause health problems at low levels of exposure—especially for people who are particularly sensitive to effects of these contaminants. In recent years, the majority of scientific review committees formed to evaluate the available scientific information on arsenic and lead have concluded that there is a sufficient scientific basis for efforts to reduce exposure to these contaminants.

In Washington State, these issues are resolved as part of administering the state hazardous substances cleanup law – MTCA. The precalculated soil clean up level for unrestricted land use under MTCA is set at 20 parts-per-million in soil, with an opportunity for individuals to work with Ecology to establish a higher or lower site-specific cleanup level based on site-specific features, such as soil type and depth to ground water. The precalculated soil cleanup level for arsenic is based on an evaluation of the potential cancer risks to young children from exposure to arsenic through soil ingestion and skin contact with soil. In a nation-wide survey 20 states reported having precalculated arsenic cleanup levels ranging from less

than 1 part-per-million to 250 parts-per-million, with 18 of the 20 states reporting cleanup levels of 20 parts-per-million or less.² For lead, the precalculated MTCA soil cleanup for unrestricted land use is set at 250 parts-per-million in soil, with an opportunity for individuals to work with Ecology to establish a higher or lower site-specific cleanup level based on site-specific features. The precalculated soil cleanup level for lead is based on preventing elevated blood lead levels in young children, with a goal of identifying soil concentrations that are unlikely to cause a blood lead level greater than 10 milligrams per deciliter using the EPA Integrated Exposure Uptake Biokinetic Model for Lead in Children.

Debate over the appropriateness of these precalculated cleanup levels will continue in the context of evaluations of individual cleanup sites. For some sites, site-specific cleanup levels are established at concentrations that are higher than the precalculated levels. It is also not unusual for site-specific cleanups to use a “remediation level” that is higher than the cleanup level to define areas where specific cleanup actions will occur. For example, education may be the remedy if concentrations of arsenic are between 20 and 200 parts-per-million, with containment serving as the remedy where concentrations are above 200 parts-per-million.

Task Force Approach to Considering Risks from Arsenic and Lead and Guiding Principles for Recommendations about Protection measures

The Task Force was not chartered to evaluate or give recommendations about the scientific information available on exposures to low-to-moderate arsenic and lead soil contamination or to resolve disagreements among scientists. The Task Force also was not chartered to evaluate or give recommendations on the MTCA cleanup levels for arsenic and lead in soil. In fact, this issue was specifically identified by the Agencies as beyond the scope of the Task Force process. Rather, the Task Force evaluated the following question in light of its understanding of the range of views about the potential risks associated with exposure to low-to-moderate arsenic and lead soil contamination:

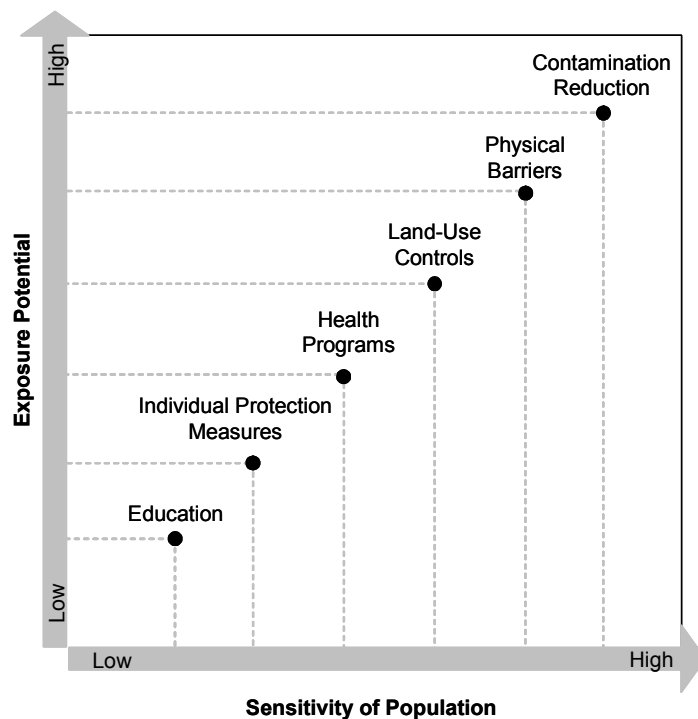
What are effective, practical, and affordable steps that people, communities, and government agencies might take to reduce exposure to arsenic and lead in soil, particularly for vulnerable populations such as children?

² Note that 250 parts-per-million was reported as the upper bound of a range of site-specific arsenic cleanup levels in Colorado and is likely not comparable to other precalculated cleanup levels which typically use default exposure assumptions. Data from the Association for Environmental Health of Soils survey of state approaches to arsenic regulation.

In considering this question, the Task Force developed a number of guiding principles for responses to low-to-moderate arsenic and lead soil contamination. These principles guided the Task Force's recommendations about response actions and should guide the Agencies and other organizations' implementation of Task Force recommendations. The guiding principles are:

- Lower adverse health risk: Despite the fact that concentrations of arsenic and lead in soil may be above state soil cleanup levels, the Task Force believes that the level of risk associated with exposures to low-to-moderate arsenic and lead soil contamination appears to be relatively low when compared to risks at sites where smelters operated or where lead arsenate pesticides were formulated (i.e., sites with higher concentrations of contaminants). Resources to address contaminated in Washington State are limited, and addressing area-wide soil contamination sites will compete with addressing more traditional cleanup situations. Beyond the broad-based education and awareness building discussed below, the Task Force does not recommend that additional remediation responses are needed at every individual property with low-to-moderate arsenic and lead soil contamination, unless children are present and may be exposed or activities such as gardening increase the likelihood of exposure for adults.
- Focus on exposure of children: While adults are also vulnerable to adverse health effects from arsenic and lead and should not be ignored, the Task Force felt a special responsibility to address protection of children. Resources devoted to assessing and responding to area-wide soil contamination should be focused on locations where there is the highest risk of exposure and should be targeted at protecting children, who are especially vulnerable to the adverse health effects of lead. The vulnerability of the population, likelihood of exposure, level of contamination, and the duration or frequency of exposures are the most important factors in informing whether response actions are necessary and, where actions are needed, in informing the specific actions selected.
- Responses increase as exposure increases: Responses to area-wide soil contamination should be commensurate with the level of concern associated with potential. In general, the effectiveness of responses to area-wide soil contamination should increase as exposures become more likely (because of likelihood of extent of contact), more prevalent (because of more individuals exposed), or more intense (because of higher levels of contamination). This concept can be illustrated by the following diagram.

**Figure 14: As the Potential for Exposure and Sensitivity of the Population Increases
More Effective Protection Measures Should be Used**



- Decisions should be made locally: The Task Force recommends what it believes are effective, practical, and low-cost methods to respond to area-wide soil contamination. However, the Task Force recommendations are only guidelines. Each person or community affected by area-wide soil contamination should implement a response that meets their priorities, objectives, and tolerance for risk, even if those responses differ from those recommended by the Task Force. For example, some individuals or communities might choose to remove contaminated soil, even though less costly measures would also be effective, because they do not want to maintain other protection measures over time.

Using these guiding principles, the Task Force considered a wide range of protection measures and developed the recommendations in the remainder of this report.

Range of Protection measures Considered and Evaluation of Protection measures

Part of the charge to the Task Force was to consider the full range of protection measures that might be used to respond to area-wide soil contamination and to make recommendations about the protection measures that are most appropriate. To organize their discussions, the Task Force identified six categories of protection measures.

- **Education programs** refer to broad-based, community-wide efforts to inform individuals and businesses of the presence of contamination and changes in behavior that can be taken to limit or reduce exposure to the contamination. Such programs use a wide range of techniques to distribute information and increase public awareness.
- **Public health programs** generally involve activities designed to identify and focus protection measures on specific populations within a community considered to be at high risk. They often include health monitoring activities (e.g., blood lead testing or urinary arsenic screening), one-on-one education on steps to reduce exposure, and intervention activities to address sources contributing to elevated exposures.
- **Individual protection measures** are simple, day-to-day things that individuals can do to limit or reduce exposure to soil contaminants. Examples include hand washing, removing shoes before entering homes, using gloves while gardening, scrubbing fruits and vegetables before eating them, wet mopping to clean surfaces indoors, bathing pets, and washing toddler toys.
- **Land-use controls** are actions by government or private agreements that provide information on the presence of contamination on a property and/or that limit or prohibit activities that could result in exposure to contaminants or harm to a physical barrier on the property. Examples include zoning, permits and licenses, covenants, easements, deed and plat notices, and real-estate disclosure.
- **Physical barriers** prevent or limit exposure to contaminated soil or unauthorized access to a property. They may be used in combination with excavation to consolidate contaminated soil on

a particular part of a property. Examples include fences, grass cover, wood chips, clean soil cover, geotextile fabric barriers (used under wood chips or clean soil cover), and pavement.

- **Contamination reduction** involves reducing the concentration of contaminants in soil or removing the contamination for disposal at another location or in a contained area on a property. Examples include soil blending or tilling, soil removal and replacement, and phytoremediation.

The Task Force also identified four criteria that should be used to evaluate protection measures: human health effectiveness, ecological effectiveness, cost, and practicality. To support Task Force deliberations, the contractor project team then researched specific protection measures within each category and rated each protection measure according to the Task Force's criteria. Each protection measures considered was rated for three land-use scenarios: a 0.2-acre residential property, a 2-acre residential property, and a 20-acre undeveloped property. The results of this evaluation were critical in informing Task Force recommendations and are

summarized below. The full evaluations of each protection measure considered by the Task Force are included in Appendix E.

Examples of Protection measures Considered

- **Education Programs:** Public Meetings, Brochures and Newsletters; School-Based Programs; Posting No Trespassing Signs.
- **Public Health Programs:** Health Monitoring and Home Visits or One-on-One Intervention
- **Individual Protection Measures:** Personal Hygiene Practices; Washing Garden Vegetables and Fruit; Reduce Dirt and Dust Inside the Home
- **Land Use Controls:** Permits and Licenses, Deed Notices, Real Estate Disclosure Forms and Practices
- **Physical Barriers:** Fencing, Vegetative Cover, Wood Chip Cover, Clean Soil Cover, and Pavement Cover
- **Reducing Contamination:** Soil Blending/Tilling; Soil Removal and Replacement, and Phytoremediation

Evaluation Criteria

Each protection measure considered was rated according to the criteria established by the Task Force. Rating methods were adjusted to account for differences in the ways that protection measures work.

The evaluation of human health effectiveness for protection measures in the categories education programs, public health programs, individual protection measures, and land-use controls was based on the level of participation these measures attract and the ability of these measures to influence participants to change behaviors or implement recommended actions to reduce exposure to contamination. Human

health effectiveness for physical barriers and reducing contamination was based on the ability of these measures to reduce the potential for exposure to contamination. Each protection measure was rated for each land-use scenario on a scale from “no effect” to “very effective.”

For ecological effectiveness, each protection measure was rated for each land-use scenario using the same “no effect” to “very effective” scale. Protection measures in the categories education programs, public health programs, individual protection measures, and land-use controls do not reach ecological receptors such as birds, rodents, and reptiles and were therefore all rated as having “no effect” for ecological receptors. Ecological effectiveness for physical barriers and reducing contamination was based on the ability of the protection measure to reduce exposure to terrestrial plants, invertebrates, and wildlife.

Cost for the two residential scenarios was based on applying the protection measure to a population of 10,000 residents and 4,000 properties. Based on the study of the nature and extent of area-wide soil contamination, accessible contaminated soil was assumed to be present at a depth of 0.5 to 1.5 ft. over one-half of the 0.2-acre property and 90 percent of the 2-acre property. Cost for the 20-acre pre-development property was based on applying the protection measure to a single 20-acre pre-development property. Accessible contaminated soil was assumed to be present over the entire 20 acres at a depth ranging from 0.5 to 1.5 ft. Costs for application of the pavement cover protection measure to the 20-acre pre-development property assume that contaminated soil is excavated, consolidated to 20 percent of the original property size, and that an asphalt pavement cover is placed over the soil. A 30-year project life is assumed for protection measures with recurring annual costs (e.g., education programs, public health programs). Each protection measure was rated for each land-use scenario using a cost scale from \$0 to \$200,000 for all affected properties to over \$200,000,000 for all affected properties.

Evaluations of practicality were based on the technical, social, and administrative barriers to implementing a protection measure. For example, there are few social or technical barriers to holding public meetings or sending brochures, but excavating all the soil from yards on small, developed residential lots is technically challenging and socially disruptive. Practicality ratings do not consider the ability to obtain funding. Each protection measure was rated for practicality in each of the three land-use scenarios using a scale of “not practical” to “very practical.”

Rating of Protection Measures

The results of the evaluations and rating of protection measures were summarized for the Task Force in Fall of 2002. In general, the protection measures that relied on individuals to take and maintain actions to

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reduce the potential for exposure to arsenic and lead in soil were considered less effective, but were also less costly and more practical, while protection measures that involved placing physical barriers between people and contamination or removing contamination were considered more effective, but also more costly and less practical.

Protective measures in the education programs category are generally minimally effective in protecting human health, are on the lower end of the cost scale, and are somewhat to very practical. Public health programs are minimally effective (health monitoring) or somewhat effective (home health care visits) are on the lower end of the cost scale, and are practical. Individual protection measures are minimally effective (maintain good personal hygiene, remove shoes before entering the home) or somewhat effective (washing garden vegetables and minimizing dirt and dust in the home), are on the lowest end of the cost scale, and generally are very practical. Land-use control programs were considered minimally effective to effective, are on the lowest end of the cost scale, and on average were considered practical. (They tend to be more effective and practical for undeveloped properties.) None of these measures offer protection for ecological receptors.

Protective measures that involved placing and maintaining physical barriers between people and contamination, such as maintaining good soil cover generally are effective, in the mid- to upper end of the cost range, and minimally to somewhat practical. Protective measures that involved reducing contamination are somewhat effective (phytoremediation) or very effective (blending/tilling or removing soils) at reducing exposures for humans and ecological receptors, are at the mid- to upper end of the cost range, and are somewhat practical to minimally practical. Physical barriers and measures to reduce contamination tend to be both less costly and more practical at vacant properties.

Table 2: Summary Ratings of Protection measure Categories

Protection measure Category	Residential Property				Undeveloped/Vacant Property			
	Human Health Effectiveness	Ecological Effectiveness	Cost	Practicality	Human Health Effectiveness	Ecological Effectiveness	Cost	Practicality
Education Programs	●○○○	○○○○	●●●○	●●●○	●○○○	○○○○	●●●○	●●●○
Public Health Programs	●○○○	○○○○	●●●○	●●●○	●○○○	○○○○	●●●○	●●●○
Individual Protection Measures	●○○○	○○○○	●●●●	●●●●	NA	NA	NA	NA
Land-use Controls	●○○○	○○○○	●●●●	●●●○	●●○○	○○○○	●●●●	●●●○
Physical Barriers	●●●○	●○○○	●○○○	●●○○	●●●○	●○○○	●●●○	●●○○
Reducing Contamination	●●●○	●●●○	●○○○	●●○○	●●●○	●●●○	●●○○	●●○○

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Explanation of Ratings

Effectiveness ratings are based on the following scale:

- = No Effect
- = Minimal Effect
- = Some Effect
- = Effective
- = Very Effective

Cost ratings are based on the following scale:

- = over \$200,000,000
- = \$20,000,000 to \$200,000,000
- = \$2,000,000 to \$20,000,000
- = \$200,000 to \$2,000,000
- = \$0 to \$200,000

Practicality is rated on the following scale:

- = Not Practical
- = Minimally Practical
- = Somewhat Practical
- = Practical
- = Very Practical

There was not much change in the rankings of protective measures between the land-use scenarios—most measures were ranked the same for a 0.2-acre or a 2-acre residential property and for a 20 acre undeveloped property. However, protective measures that rely on physical barriers or involve reducing contamination are slightly more practical and less costly at larger, undeveloped properties. Furthermore land-use controls such as zoning, permits, and licenses are more effective and more practical at undeveloped properties.

6. Broad-Based Education and Awareness Building

This section describes Task Force recommendations on the elements and audiences for a broad-based education and awareness building campaign about area-wide soil contamination. The Task Force believes that in most cases, decisions about responses to area-wide soil contamination should be made by the individuals who may be exposed to low-to-moderate arsenic and lead soil contamination or, in the case of children, by parents or other caretakers. Broad-based education and awareness building is the foundation of the Task Force's recommendations because it will serve to give residents the information they need to make responsible choices about managing the potential for exposure to arsenic and lead. The Task Force recommendations on broad-based education and awareness building support and underlay all other recommendations and are cross-referenced in the sections on responses in specific land-use scenarios later in this Report.

Recommendations

To assist individuals and communities in their decisions about responses to area-wide soil contamination, the Agencies should work with and through local governments, particularly local health departments, to increase knowledge of area-wide soil contamination through a broad-based education and awareness building campaign. The Task Force believes that broad-based education and awareness building is an appropriate foundation recommendation for a number of reasons. First, removing low-to-moderate arsenic and lead soil contamination from all the areas in which it is located is not practical. There are well over 600,000 acres potentially affected by area-wide soil contamination in Washington State. Even if resources were available to carry out soil removal or other activities to reduce contamination at all these locations, the social, technical and logistical challenges would be prohibitive. For example, how would the government obtain access to hundreds of thousands of individual properties to address contaminated soils? Where would residents go? Where would clean soil be located? The Task Force quickly rejected widespread soil removal and similar activities as not appropriate to the special challenges posed by area-wide soil contamination.

Second, the Task Force was not convinced that removing low-to-moderate arsenic and lead soil contamination is necessary to protect human health. Evaluations of the full range of protection measures carried out to support Task Force deliberations showed education programs, individual protection measures and placing and maintaining physical barriers such as good soil cover between people and contaminated soil while not as effective as soil removal, do have effectiveness. These types of protection measures cost much less than soil removal and are more practical to implement. The Task Force believes the effectiveness of these measures will be increased by the step-wise approach they recommend, so that education programs combined with programs encouraging practice of individual protection measures and maintenance of good soil cover are likely more effective than either program on its own. Finally, the Task Force emphasizes that, as recognized by the Agencies in initiating this project, currently there is no systematic statewide effort to address area-wide soil contamination, the majority of potentially affected properties are not being addressed, and there is no plan to address them. In this context any approach that systematically encourages individuals to understand area-wide soil contamination problems and provides them with the support and information necessary to make responsible choices about limiting exposure to arsenic and lead in soil is a marked improvement over the current climate.

The Task Force believes that area-wide soil contamination can be lived with successfully and safely, without adverse impacts on residents or businesses. *[Placeholder for text on Dept. of Agriculture's*

approach for orchard land that shifts to other agricultural uses, example of successful management of area-wide soil contamination concerns.]

Goals of Broad-Based Education and Awareness Building

The goal of broad-based education and awareness building should be to provide individuals, organizations, and communities with the information and materials they need to make knowledgeable and responsible choices about responding to area-wide soil contamination. Education and awareness building materials and activities should be carefully balanced to adequately inform citizens about the area-wide soil contamination issues while, at the same time, avoid creation of unnecessary fears and other unintended consequences. In general, education and awareness building should prioritize issues associated with risks associated with exposure of children and of adults who have frequent contact with soil. The most important audiences for education and awareness building are gardeners, other adults who frequently work in soil, and people and organizations that care for or work with children, including parents, educators, healthcare providers, and childcare providers. Parents and others should be encouraged to consider not only the potential for exposure on their properties, but also the potential for exposure in other places where children play, including vacant properties, and at construction and work sites in area-wide soil contamination areas.

A “Toolbox” of Information is Needed

To support broad-based education and awareness building, the Agencies should develop a toolbox of information and materials to help individuals (e.g., parents) and organizations (e.g., schools) answer questions about the potential for arsenic and lead contamination at specific properties and identify actions they can use to reduce exposure to arsenic and lead. At a minimum, this toolbox should include the following:

- Maps showing where area-wide soil contamination is most likely to be found. The Task Force recommends a specific approach to mapping discussed in detail in Section 4 of this report.
- Materials that provide context for the maps and describe the variability of the nature and extent of area-wide soil contamination, so individuals outside of areas identified on maps are not given a false sense of assurance that they cannot encounter elevated levels of arsenic and lead in soil and individuals inside areas identified on maps are not given a false sense of concern. The Task Force recommends a specific approach to map-accompanying information which is also discussed in Section 4 of this report.

- Materials, including flow charts and checklists, that describe how residents can use easily observable features of a property to evaluate whether elevated levels of arsenic and lead in soil are likely to be present and whether exposure to soil is likely. This process is referred to as a “qualitative evaluation” process and is discussed further in other sections of this report, including the section on child-use areas where a specific qualitative evaluation checklist is recommended.
- Materials providing guidance on how to collect and analyze soil samples at typical types of properties (e.g., a residential yard) to determine if elevated levels of arsenic and lead in soil are present. Note that the Task Force does not assume or recommend that soil testing is necessary at each property potentially affected by area-wide soil contamination and emphasizes that where area-wide soil contamination is likely, individual protection measures and maintenance of good soil cover should be used to minimize the potential for exposure to arsenic and lead.
- Information on the health risks associated with exposure to low-to-moderate arsenic and lead soil contamination, particularly the health risks associated with exposures of children and information on how parents can obtain blood lead level screening for their children.
- Materials, such as those developed by Public Health (Seattle & King County), that encourage good personal hygiene practices and other individual protection measures, such as frequent hand washing with soap and water to reduce exposure to arsenic and lead in soil.
- Materials, such as those developed by the Washington State University Cooperative Extension, that describe individual protection measures, such as thorough washing of vegetables to remove dirt particles before eating, where soil has elevated levels of arsenic and lead.
- Materials, such as those developed by the Snohomish Health District, that describe individual protection measures such as wearing gloves and not eating or drinking in contaminated areas for utility and other workers, who may frequently come into contact with contaminated soil through their work.
- Materials describing the range of protection measures that might be taken to respond to area-wide soil contamination to complement use of individual protection measures, in particular materials that describe actions that can be taken to maintain good soil cover.

Individual Protection Measures to Minimize Potential Exposure to Arsenic and Lead in Soil
(Based on Guidelines Developed by the King and Snohomish County Health Districts)

Inside Your Home:

- Take off your shoes before entering your home.
- Wash hands and face thoroughly after working or playing in the soil, especially before eating or preparing food. Use water and soap to wash - avoid “waterless” soaps.
- Wash hands your hands after handling your pet, and bathe pets frequently.
- Wash toddler toys and pacifiers often.
- Wash clothes dirtied by contaminated soil separately from other clothes.
- Clean surfaces by wet mopping, spraying with water, or vacuuming with a HEPA filter. Don’t sweep or blow the surface.
- Change air filters regularly and properly maintain your heating, ventilation, and air conditioning system.
- Maintain painted surfaces in homes. Homes built before 1978 may contain lead-based paint. When older paint flakes it may become a source of lead.
- Minimize children’s exposure to hobbies that use lead (e.g., in lead solder or paint).
- Eat a balanced diet. Iron and calcium help keep lead from becoming a problem in the body.

Outside Your Home:

- Keep children from playing in contaminated dirt.
- Do not eat or drink in contaminated areas.
- Keep pets off of exposed dirt so they don't track it into the house.
- Fill any holes where dogs may be digging as soon they are noticed.

Special Considerations for Gardeners:

- Dampen dusty soils before gardening in soil.
- Wear gardening gloves.
- Keep vegetable gardens away from old painted structures and treated wood.
- Do not plant food crops under the roof overhang of your home.
- Scrub vegetables and fruits with soap and water before eating them.

Special Considerations for Adults Doing Construction or Yard Work:

- Avoid all unnecessary exposure to soil or dust.
- Dampen dusty soils before and during the work project
- Wear clean, full body protective clothing (coveralls or long sleeve shirt and pants), shoes, and gloves. For maximum protection, wear a dust mask or other respiratory protection.
- Use caution while eating, drinking, or smoking while in the work area to avoid ingesting dirt.

- Materials that identify organizations—such as local health jurisdictions, land-use planning offices, the National Lead Information Center, and regional offices of the Department of Ecology, the U.S. Department of Housing and Urban Development (HUD), and the Environmental Protection Agency (EPA)—and individuals that are available to answer questions and provide additional help in understanding and responding to area-wide soil contamination.

What Are Additional Protection Measures?

Additional protection measures are actions that individuals or organizations can take to physically alter properties in a way that reduces the potential for people to come into contact with contaminated soil. The additional protection measure most often recommended by the Task Force is to maintain good soil cover. Good soil cover can be maintained in a variety of ways, such as:

- Thoroughly cover bare patches of dirt with grass, bark, or other material, or fence off area.
- Install a geotextile fabric barrier and at least 5-12 inches of surfacing material such as woodchips, mulch, or pea gravel under play equipment.
- Bring in soil with low arsenic and lead content for use in garden beds.

Additional protection measures might also include:

- Contain contaminated soil under paved surfaces, structures, or in landscaping berms.
- Remove and replace contaminated soil, especially in children's play areas and gardens.
- Till or blend soils to reduce surface concentrations of arsenic and lead.

The Task Force has developed a toolbox on area-wide soil contamination for the Agencies to consider. This is attached as Appendix F.

In addition to materials for general use, targeted materials should be developed for individuals who typically care for children and adults who have a higher potential to come into contact with contaminated soil.

In particular, targeted materials for people who typically care for children should explain the health risks associated with exposures of children to arsenic and lead, how to use qualitative evaluations to determine the potential for children to be

Target Audiences for Education and Outreach

Targeted materials should be developed for the following specific audiences:

- Parents of young children
- Childcare providers and preschool operators
- School officials and operations, maintenance and grounds keeping staff
- Park officials and operations, maintenance and grounds keeping staff
- Gardeners
- Real estate professionals
- Construction, utility and other workers who have routine contact with soil
- Healthcare providers
- Homebuilders associations
- Local planning and zoning officials
- Agricultural workers and landlords with farm unit rentals and picker camps

exposed to arsenic and lead in soil at a specific property, and, if potential exposures exist, how to mitigate exposures through good personal hygiene practices, other individual protection measures, and maintenance of good soil cover.

The Task Force emphasizes that it is important for education and outreach materials to be written in a way that makes the information easily understandable for people who may not be accustomed to evaluating issues associated with exposure to hazardous substances in soil. To be effective, materials must be targeted for specific audiences and must be accompanied by outreach and follow up. Ongoing outreach is particularly important because it is likely that elevated levels of arsenic and lead in soil will remain at many affected properties for many years. Outreach will encourage people to remain attentive to area-wide soil contamination issues over time, and do not, for example reduce their practice of individual protection measures or let soil cover deteriorate. In addition, materials should be made available in appropriate languages for the range of potentially affected communities.

A Step-Wise Approach is Appropriate

To use resources effectively, the Agencies should take a step-wise approach to providing information about area-wide soil contamination, as follows.

Step 1: The Agencies should make basic, overview educational materials about area-wide soil contamination available to all residents. At a minimum, materials should be made available using the following means:

- Development and maintenance of an area-wide soil contamination website.
- Distribution to libraries and other public information repositories.
- Distribution to Ecology regional and field offices, local health departments, and to other locations where residents may go to seek information on environmental and health conditions.

Step 2: In areas where area-wide soil contamination is likely, the Agencies should accompany educational materials with outreach. Outreach should include routine briefings, trainings, and workshops for local health departments and other appropriate organizations to facilitate informed distribution of educational materials and ensure a solid understanding of health risks and exposure reduction measures. The Agencies should work with local governments and other organizations, such as parent teacher

associations, that distribute information to develop strategies designed to ensure that educational materials reach target audiences. For example, a county planning department could distribute a fact sheet on minimizing exposure to arsenic and lead in soil as part of the building permitting process.

Where Is Area-Wide Soil Contamination Likely?

It is not possible to precisely define the boundaries of area-wide soil contamination. However, based on available data, area-wide contamination is likely to be found in portions of counties potentially affected by smelter emissions, such as King, Pierce, Snohomish, and Stevens counties, and areas where apple and pear trees were grown historically, such as portions of Chelan, Okanogan, Spokane, and Yakima counties.

Step 3: Where area-wide soil contamination is known to exist, the Agencies should provide additional outreach, education, and resources as described in the specific scenario discussions below.

Monitoring and Evaluating Effectiveness

Finally, the Agencies should monitor and evaluate the effectiveness of education and awareness building efforts in increasing implementation of good personal hygiene practices and other individual protection measures to reduce the potential for exposure to arsenic and lead in soil. Information gathered during this monitoring and evaluation should be used to improve and update education and awareness building efforts. *[Placeholder: for additional detail on this based on effectiveness studies associated with the education efforts on the Tacoma Smelter Plume being planned for Pierce and King Counties.]*

7. Recommendations for Specific Land-use Scenarios

This section contains Task Force recommendations for specific actions that should be taken to complement broad-based education and awareness building in specific land-use scenarios. Additional actions might be recommended, for example, in situations where the Task Force was particularly concerned about a specific population, such as children. Additional recommendations might also be structured to take advantage of opportunities to leverage ongoing activities to implement more aggressive measures to reduce the potential for exposure to arsenic and lead in soil, such as when vacant land is being developed into another use. The Task Force emphasizes that these activities are meant to build upon and complement—not replace—broad-based education and awareness building.

7a. Child-Use Areas

The Task Force is particularly concerned about exposure of young children to arsenic and lead in soil. Children tend to have greater exposure than adults to soil and dust because they often play on the ground tend to put things in their mouths, such as hands, pacifiers, and toys, which may have soil on them. Children are particularly at risk from lead because, when exposed, they absorb more lead than adults, and their rapidly developing nervous systems are sensitive to lead damage. Parents are likely already aware of the need to protect children from lead poisoning as a result of long-standing programs established to prevent children from exposure to residues from lead-based paints. Actions to address widespread soil contamination in other states and countries, as well as ongoing efforts to address area-wide soil contamination in Washington State, tend to prioritize activities that address protection of children. The Task Force felt a special responsibility to recommend actions that address even the potential for children to be exposed to arsenic and lead in soil and spent much of its time considering recommendations for child-use areas.

Types of Child-use Areas Considered and Prioritizing Activities at Publicly Maintained Areas

The Task Force considered a number of types of child-use areas: primary schools and their associated playgrounds and playfields; public playgrounds and playfields (such as those at public parks); day- and childcare facilities, including preschools and family home daycares; and camps. The Task Force also distinguished between publicly maintained child-use areas, such as public schools and parks, and privately maintained areas, such as private schools, playgrounds, and childcare facilities. In general, the Task Force believes that the same responses are appropriate at both public and private child-use areas and that over time potential exposure at all child-use areas in areas where area-wide soil contamination is likely should be addressed. However, the Task Force also recognized that it may not be practical to address all child-use areas immediately. Accordingly, the Task Force recommends that publicly maintained child-use areas should be prioritized and responses in these areas should set the standard for protection of children. Finally, the Task Force notes that many residential properties are, essentially, child-use areas. As discussed later in this report, parents and other caretakers of children should be attentive to the need to protect children from potential exposures to arsenic and lead in soil at home as well as at school.

Recommendations

In addition to the targeted education and awareness building discussed earlier in this report, the Task Force recommends five responses for child-use areas where area-wide soil contamination is likely.

- Immediate implementation of individual protection measures and maintenance of good soil cover in areas where children play to reduce the potential for children to be exposed to contaminated soil.
- Qualitative evaluations to increase understanding of where exposure could occur and to focus implementation of soil testing and additional protection measures.
- Soil testing where qualitative evaluations indicate the potential for exposure to contaminated soil and implementation of additional protection measures if contamination is found.
- Soil testing at new public child-use area construction sites and implementation of additional protection measures if contamination is found.
- Special approaches, including targeted outreach and a voluntary certification program, for family home daycares and daycare centers

Each of these recommendations is described below.

Implementation of individual protection measures and maintenance of good soil cover

The first step in taking action to minimize the potential for children to be exposed to elevated levels of arsenic and lead in soil should be implementation of individual protection measures and maintenance of good soil cover in areas where children play. The Task Force emphasizes that it is not necessary to confirm that elevated levels of arsenic and lead are present in soil before implementing individual protection measures and providing for good soil cover. Rather, where area-wide soil contamination is likely, the Task Force strongly recommends that individual protection measures and maintenance of good soil cover be instituted immediately unless 1) qualitative screening indicates that elevated soil levels of arsenic and lead are not likely or it is unlikely children could be exposed to soil or 2) quantitative soil testing shows that elevated levels of arsenic and lead in soil are not present.

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The Task Force believes this is a reasonable approach primarily for two reasons. First, as discussed above, children are the population most vulnerable to adverse health effects from area-wide soil contamination, particularly from exposure to lead. Second, implementing individual protection measures and providing for good soil cover in play areas are, to a great extent, consistent with the types of good personal hygiene practices and routine maintenance activities that should already be in place at schools, parks, daycares, and other child-use areas.

The Task Force recommends that the Agencies work with local health jurisdictions to support, encourage, and assist with implementation of individual protection measures. This may include providing training, briefings, or other assistance or materials to local health jurisdictions. In addition, the Agencies should work with local jurisdictions and other organizations, such as the Washington Association of Maintenance and Operations Administrators, to support, encourage, and assist with activities that maintain good soil cover and to integrate these activities into already ongoing landscaping and maintenance. This may include providing training or information on the relative effectiveness of soil covers and methods to ensure that soil covers remain effective. Grass, for example, may not be an effective cover for contaminated soil on an athletic field or other child-use area if it is not properly maintained.

What Does It Mean for the Agencies to Provide Support, Encouragement, and Assistance to Local Jurisdictions?

The Task Force recognizes that local governments, such as health departments and school districts, will often be the primary implementers of its recommendations. In many places, the Task Force advises the Agencies to provide “support, encouragement, and assistance” to these local jurisdictions. Besides noting the need for financial support, which the Task Force expects will be universal, the Task Force has not attempted to precisely define what this support, encouragement, or assistance might involve. The Task Force emphasizes that the first step is for the Agencies to reach out to local jurisdictions in areas where area-wide soil contamination is likely to provide information on the issue and the Task Force recommendations, and to ask what types of assistance and support the local jurisdictions might need.

What Should the Agencies Do if Local Jurisdictions Choose Not to Take Action to Address Area-Wide Soil Contamination?

The Task Force believes that as knowledge of the area-wide soil contamination issue increases, local jurisdictions will take action to respond. In situations where local jurisdictions choose not to address area-wide soil contamination, the Agencies should do what is within their capacity to advance implementation of the Task Force recommendations.

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What Are the Current Approaches for Child-use Areas?

There are a number of projects to address area-wide soil contamination at child-use areas across Washington state, including projects associated with the ongoing cleanups of the Tacoma and Everett smelter sites and other affected properties, and projects at a number of schools and parks built on properties affected by past use of lead arsenate pesticides, including schools in Chelan and Okanogan Counties and parks in the City of Yakima. Current approaches often involve outreach to school officials to provide information and support for implementation of individual protection measures and maintenance of good soil cover, and systematic soil sampling at the child-use area under consideration, followed by selection and implementation of additional protection measures. The Agencies typically provide both technical and financial assistance for ongoing responses in child-use areas.

Qualitative evaluations to increase understanding of where exposure could occur and to focus implementation of soil testing and additional protection measures.

The Task Force strongly encourages property owners/managers of other child-use areas to carry out qualitative evaluations of the potential for exposure to arsenic and lead in soil in places routinely used by children. Qualitative evaluations should use easily identifiable factors (such as elevation at properties potentially affected by historical use of lead arsenate pesticides) to determine if elevated levels of arsenic and lead in soil are likely, and easily observable features (such as the presence or absence of bare dirt) to identify situations when there is the greatest potential for exposure. Qualitative evaluations should be focused on identifying situations where there is or could be direct, daily contact with contaminated soil over a period of months or direct contact with particularly high concentrations of arsenic or lead. The Task Force recommends that the following checklist be used to carry out qualitative evaluations.

Table 3: Citizens' Qualitative evaluations Tool for Determining Potential Exposures to Lead and Arsenic Contamination

<i>Please visit and walk around the site, preferably during daylight hours, before answering these questions.</i>	
Q1. <i>Is the property near a historical smelter location in Pierce, King, Snohomish, or Stevens counties?</i>	If YES or UNSURE, go to Q4. If NO, go to Q2.
Q2. <i>Were lead arsenate pesticides used on the property historically (e.g., on apple or pear trees)?</i>	If YES or LIKELY, go to Q4. If NO, go to Q3.
Q3. <i>Are portions of the property within 25 feet of a road built before 1995?</i>	If YES or UNSURE, go to Q4. If NO, elevated levels of arsenic and lead are not likely to be present in soil.
Q4. <i>Do children routinely play in this area?</i>	If YES or UNSURE, go to Q7. If NO, go to Q5.
Q5. <i>Do people spend a lot of time in this area (e.g., while gardening)?</i>	If YES or UNSURE, go to Q7. If NO, go to Q6.

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Q6: Are there frequently used, unpaved paths or trails through this area?	If YES or UNSURE, go to Q7. If NO, potential exposure to elevated levels of lead and arsenic in soil is less likely.
Q7: Is there any exposed dirt in play and high use/traffic areas (e.g., swing sets, gardens, sports fields, lawns, and paths)? Note: Asphalt, wood chips, grass cover, or other natural/synthetic barrier may help limit potential exposure to contaminated soil. The Consumer Product Safety Commission recommends that surfaces around playground equipment have at least 5-12 inches of wood chips, mulch, sand, or pea gravel, or are covered with mats made of safety-tested rubber or rubber-like materials.	If YES or UNSURE, there may be a higher potential for exposure to contaminated soils. Use individual protection measures to minimize potential exposure and determine whether to test soils. If NO, go to Q8.
Q8: Would you expect soils to be exposed at any time during the year (e.g., due to seasonal sports or other activities)?	If YES, there may be a higher potential for exposure to contaminated soils. Use individual protection measures to minimize potential exposure and determine whether to test soils. If UNSURE, check with the landowner or organization responsible for maintaining the property to see whether a maintenance program is in place to ensure that play and high use/traffic areas remain thoroughly covered year round. If NO, the potential for exposure to contaminated soils is less likely.

Soil Testing and Implementation of Additional Protection Measures

Where qualitative evaluations indicate that children may be routinely exposed to contaminated soil, the Task Force recommends that property owners/managers of child-use areas conduct soil sampling to determine if elevated levels of arsenic and lead are actually present in soil. Guidance on how to carry out soil sampling is part of the “toolbox” of information discussed in Section 6 of this report and included in Appendix F.

Where soil sampling results indicate that elevated levels of arsenic or lead are present, property owners/managers of child-use areas should implement additional protection measures to reduce the potential for children to come into contact with contaminated soil. Additional protection measures to reduce potential exposure could include installing protective barriers such as geotextile fabric between soil and soil cover, removing and replacing small amounts of contaminated soil, or consolidating and containing contaminated soil under buildings, paved surfaces, or landscaping berms.

The Agencies should assist local jurisdictions, other organizations, and individuals in selecting and implementing additional appropriate protection measures where soil contamination is found. In addition, where physical barriers to reduce the potential for contact with contaminated soil are used, the Agencies should work with local jurisdictions and other organizations, such as the Washington Association of Maintenance and Operations Administrators, to integrate protection measures into ongoing landscaping and maintenance activities, and to ensure that these barriers are maintained and remain effective.

In addition, the Agencies should work with school districts, park agencies, and other appropriate organizations to facilitate understanding of area-wide soil contamination and to prioritize response actions at schools, parks, and other child-use areas. In particular, parents of young children should be kept informed during all stages of assessment and cleanup processes through Parent Teacher Association meetings, school newsletters, community events, and other appropriate means. As with the broad-based education and awareness-building materials described earlier in this report, outreach activities where elevated soil levels of arsenic and lead are found should balance the need for accurate and complete information with the need to avoid unnecessarily frightening parents and other audiences, or creating unintended consequences or overreactions.

Finally, the Agencies should work together and with local jurisdictions to continue collection of additional soil data at public child-use areas in areas where area-wide soil contamination is likely to better understand the extent of area-wide soil contamination and the potential for children to be exposed. This is particularly important to assess the potential for children to be exposed to arsenic and lead contamination from past use of leaded gasoline (see recommendations for research on roadside lead contamination in Section 4 above).

Special Considerations for Playgrounds and Playfields

Children have the highest potential to be exposed to arsenic and lead in soil by coming into contact with contaminated dirt. The Task Force believes this is most likely to occur in areas which children routinely play, such as playgrounds and playfields. By the nature of their use, playgrounds and playfields often have spots or areas of bare dirt to which children could be exposed. Because these areas are typically publicly owned and operated, the Task Force believes there is a special responsibility to ensure that children who use these areas are protected.

In the U.S. Consumer Product Safety Commission's (CPSC) "Handbook for Public Playground Safety," guidelines for maintaining children's safety in public playgrounds recommend that woodchips, mulch, sand, gravel, or shredded tires be installed and maintained to a depth of at least 5-12 inches (depending on the surfacing material selected) under playground equipment. The *Health and Safety Guide for K-12 Schools in Washington*, developed by the Office of the Superintendent of Public Instruction and the Department of Health, already recommends that all playground equipment at primary and secondary schools in Washington conform to CPSC's playground safety standards.

For existing playgrounds at parks, schools, private camps, and daycares, the Task Force strongly recommends that the CPSC surface material guidelines be fully implemented. In areas where area-wide soil contamination is likely, the Task Force also recommends that a geotextile fabric barrier (such as landscaping fabric or weed block) be incorporated below the surfacing material under play equipment to further limit the potential for contact with soil. For other play areas, such as sports fields, the Task Force recommends that efforts be made to minimize the potential for children to come into contact with contaminated soil, such as maintaining year-around grass cover or bringing in clean soil for areas of bare dirt, such as baseball field baselines. In general, sports fields may not need the same types of actions to reduce exposure as areas with swing sets and other play equipment where young children play, due to the age of the population exposed and the amount of time children may be in contact with soil. The reasons behind any differences in approaches to reduce exposure in different types of play areas should be explained to parents and other members of the public.

Soil Testing and Implementation of Additional Protection Measures at New Child-Use Areas

Construction of new child-use areas, such as schools and playgrounds, commonly involves earth-moving activities which can create important opportunities to address area-wide soil contamination. In particular, incorporating soil sampling into the site selection and design process for new construction minimizes the additional expenses for sampling and can allow officials to modify construction plans to incorporate cost-effective, practical, and effective measures to reduce the potential for exposure of children.

Where area-wide soil contamination is likely, the Task Force recommends that officials (e.g., school districts or park managers) be required to test soils at proposed child-use sites during the site selection and design process. This is especially relevant at publicly funded child-use areas. Where soil sampling confirms that elevated soil levels of arsenic and lead are present, officials should incorporate protective measures into construction plans and budget. Protective measures might include installing a geotextile fabric barrier underneath surfacing material such as woodchips, mulch, or grass cover in play areas; removing and replacing small amounts of contaminated soil; consolidating and containing contaminated soil under buildings, paved surfaces, or landscaping berms; or other activities.

At school sites, the Agencies should work with local health jurisdictions and with the Office of the Superintendent of Public Instruction to assist school officials with the interpretation of sampling results and with the selection of protective measures. Local health inspectors should confirm that sampling has occurred at school playground construction sites and that appropriate responses have been implemented

during their regular site inspection visits. The Agencies should assist local health jurisdictions with these inspections.

Targeted Outreach and Voluntary Certification Programs for Childcare Providers

Many children spend significant amounts of time in commercial or family home daycare settings. This is particularly true for children who have not yet reached school age and who may be particularly vulnerable to exposures to arsenic and lead. Where area-wide soil contamination is likely, the Agencies should collaborate with the Department of Social and Health Services (DSHS) and local health districts to reach out to daycare providers to encourage them to implement the responses described above. To further encourage implementation of such responses, a voluntary certification program for daycare centers and family home daycares should be established. The voluntary certification program should be administered by DSHS in conjunction with the Department of Health.

What Should Be the Components of the Voluntary Certification Program?

The voluntary certification program should establish three tiers of recognition.

- Tier 1: Daycares certify that they have received and reviewed information prepared by the Agencies and/or have completed training on how to identify and minimize potential exposure using best management practices and other protection measures (through the existing STARS daycare training program and/or other annual training requirements).
- Tier 2: Daycares certify that they have contacted local health districts to help them identify and take steps to minimize children's potential exposure to arsenic and lead in soil.
- Tier 3: Daycares certify that soils have been tested and found not to contain elevated levels of arsenic and lead.

Under this program, individual certifications for the first two tiers should be timed to renew and expire in conjunction with the daycare licensing cycle (i.e., every three years); the third tier certification (for arsenic- and lead-free soils) should not need to be renewed.

7b. Residential Properties

There are numerous residential properties that may be affected by area-wide soil contamination. However, as discussed in Section 4 above, even in locations where area-wide soil contamination is likely, the actual concentrations of arsenic and lead in soil on individual properties will vary widely and some properties, if sampled, will be found not to be contaminated.

The Task Force considered a number of issues related to residential properties. The Task Force is very concerned about the number of properties potentially affected by area-wide soil contamination and the

practicality and cost of implementing protection measures at residential properties. At the same time, the Task Force recognizes that most residential properties are, essentially, child-use areas and that in many ways both children and adults are most likely to come into regular contact with soil at home through play, gardening, and other activities. Finally, the Task Force believes that selection and implementation of protection measures at residential properties with low-to-moderate levels of soil contamination are fundamentally up to residents, and that the Agencies should be focused on supporting residents in understanding the potential for elevated levels of arsenic and lead in soil at individual properties and in taking appropriate response actions. With these considerations in mind, the Task Force decided that responses to area-wide soil contamination at residential properties should be similar to, and no more stringent than, the approaches described above for child-use areas and that particular attention should be paid to three populations: children, gardeners, and other adults who frequently work in soil.

Recommendations

In addition to the broad-based education and awareness building and responses in child-use areas discussed above, the Task Force recommends that residents potentially affected by area-wide soil contamination take three responses at residential properties:

- Implement individual protection measures and maintenance of good soil cover in areas where children play to reduce the potential for exposure to contaminated soil.
- Carry out qualitative evaluations to increase understanding of where exposure could occur and to focus implementation of soil testing and additional protection measures.
- Carry out soil testing where qualitative evaluations indicate the potential for exposure to contaminated soil and implementation of additional protection measures if contamination is found.

The Task Force emphasizes that these are activities recommended to residents. The Agencies should focus their efforts on supporting residents by providing targeted education and outreach materials, and through financial support. Each recommendation is discussed further below.

Individual Protection Measures and Maintenance of Good Soil Cover

As with child-use areas, at residential properties the first step in taking action to minimize the potential for children and adults to come into contact with contaminated soil is to practice individual protection measures and to maintain good soil cover. It is not necessary to confirm that elevated levels of arsenic and lead are present in soil before taking these actions. Rather, where area-wide soil contamination is likely, the Task Force recommends that all residents follow individual protection measures and maintain good soil cover unless 1) qualitative screening indicates elevated levels of lead and arsenic in soil or exposure to soil are not likely, or 2) quantitative soil testing shows that elevated soil levels of arsenic and lead are not present.

Qualitative Evaluations

Residents within areas of area-wide soil contamination should carry out qualitative evaluations to determine the potential for their property to have elevated levels of arsenic and lead in soil and the potential for exposures to contaminated soil. Qualitative evaluations should use easily identifiable features (such as property elevation in areas potentially affected by historical use of lead arsenate pesticides) to determine if elevated soil levels of arsenic and lead are likely and easily observable features (such as the presence or absence of bare dirt) to determine if exposure to contaminated soil is likely. A qualitative evaluation checklist is included in Section 7a above.

Soil Testing and Additional Protection Measures

Where qualitative evaluations show that elevated levels of arsenic and lead in soil and/or exposures to contaminated soil are likely, residents should consider soil sampling.

Soil sampling will help inform residents' decisions about what, if any, steps beyond implementation of individual protection measures and maintenance of good soil cover should be taken to reduce potential exposures. It may also be helpful in confirming the absence of elevated levels of arsenic and lead, thereby obviating the need for individual protection measures or other responses. Guidance on how to carry out soil sampling at residential properties is included in the "toolbox" of information discussed in Section 6 of this report and included in Appendix F.

The Agencies should provide incentives and opportunities for individuals who choose to sample soils on their properties. Specifically, the Agencies should work with local health jurisdictions to provide do-it-yourself sampling kits to residents upon request; these kits should include instructions on how to collect soil samples, tools for collecting samples, clear explanations of why the sampling procedures should be

followed, and instructions on how to have soil samples analyzed. Furthermore, the Agencies should establish a mechanism to subsidize the costs of sampling at residential properties in area-wide soil contamination areas so that residents only need to pay at most nominal fees for soil analysis. Fees should be comparable to the costs to residents of other environmental monitoring programs, such as water quality testing. To provide this support, the Agencies could, for example, make XRF machines available routinely throughout the year at easily accessible locations and charge residents only minimal fees for the on-site soil analysis. If XRF machines cannot be made available, the Agencies could provide vouchers to residents for reduced or low-cost analysis of soil samples at independent laboratories.

Finally, the Agencies should work with local health jurisdictions to assist property owners in the interpretation of soil testing results and in the selection of appropriate protection measures, if the results indicate that additional responses are appropriate. The Agencies should provide the appropriate context for sampling results so that residents understand the potential health risks from exposure to contaminated soils without becoming unduly alarmed.

Confidentiality and Reporting of Sampling Results

To protect the privacy of residents who choose to take advantage of soil sampling opportunities, data from soil testing that individuals should be kept confidential and should not be associated with specific property locations in Agencies' records. In particular, the Agencies should provide incentives and opportunities to residents for sampling and assist with the interpretation of sampling results in ways that prevent the data from becoming public.³ The Agencies may need to make regulatory changes to ensure that this is possible.

Support for Additional Protection Measures Individuals Choose to Implement

Where soil sampling results indicate that elevated levels of arsenic or lead are present, residents should be encouraged to consider implementing additional protection measures to further reduce the potential for exposure to contaminated soil. In some instances, individuals may choose to take actions beyond implementation of individual protection measures to further contain, or to remove, contaminated soil. Additional protection measures might include installing protective barriers such as geotextile fabric (e.g., weed cloth) between soil and landscaping materials or other soil covers, particularly in areas where children play. Alternatively, additional protection measures might include replacing small amounts of

³ Data that the Agencies collect from soil sampling on public lands can be managed differently and can be made publicly available.

contaminated soil with clean soil in gardening areas or building raised garden beds and filling them with clean soil.

The Agencies should support individuals who choose to implement additional protection measures by providing guidance on low-cost, effective, and practical solutions for containing contaminated soils; removing and replacing small quantities of soil; and other appropriate activities. The Agencies should also provide information on where and how to dispose of contaminated soil that individuals choose to remove from their properties.

To support individuals who choose to replace small quantities of contaminated soil with clean soil, the Agencies should look for ways to make it easy for residents to locate sources of soil that meets the MTCA cleanup standards for arsenic and lead by identifying soil suppliers or other means.

7c. Commercial Areas

As discussed above, the Task Force is most concerned about exposure of children to arsenic and lead in soil. In general, commercial areas are not frequently used for play by young children and tend to be covered with impervious surfaces such as buildings, parking lots, or other man-made and maintained cover, such as landscaping bark or gravel. Because of these features, the Task Force considered commercial areas to be the most simple land-use scenario to evaluate and completed its discussions of commercial areas early in the process.

Recommendations

Where commercial areas are covered with surfaces such as buildings, parking lots, or other good soil cover, the Task Force recommends that no further response actions are necessary to address area-wide soil contamination.

[Placeholder: may want to expand discussion of commercial areas slightly so that it is not eclipsed by the longer, more detailed discussions of the other land-use scenarios.]

7d. Vacant Land

Vacant land includes undeveloped properties, agricultural land that is no longer in production, and other developed properties that are currently vacant or abandoned. The Task Force considered two categories of vacant land: vacant land that is being developed into other land uses and vacant land that is not proposed for development.

Although there is the potential for both human health and ecological impacts from area-wide soil contamination at vacant land, this section only addresses risks from human exposure. Ecological concerns at vacant land and other land-use scenarios are discussed in Section 7e below.

Recommendations

As discussed in Section 6 above, the Task Force recommends that the Agencies encourage individuals to consider potential exposures not only on their properties, but also in other areas where children play, such as vacant properties in or near residential areas, and at other garden or work sites in area-wide soil contamination areas. In addition to broad-based education and awareness building, the Task Force recommends the following activities for vacant land in areas where area-wide soil contamination is likely.

Vacant Land Being Developed into Other Land Uses

The Task Force is concerned about two populations at vacant land being developed into other land uses. First, people who live near or work at the development site such as construction workers who may be exposed to contaminated soil (including wind-blown dust) during and after construction activities. Second, people who could be exposed to contaminated soil after it is developed into a new land use. In general, the Task Force believes that responses to area-wide soil contamination at vacant land proposed for development should be consistent with the responses the Task Force recommends for the proposed land use, since the proposed land use affects the potential for exposure. For example, the recommended responses described in Section 7a above for child-use areas are appropriate for vacant land proposed for development as schools, parks, daycares, or other child-use areas. New development, however, also presents an important opportunity to carry out additional cleanup activities. Since development activities generally already involve manipulation of the soil and grade at a site, it is often cheaper and easier to implement certain protection measures during rather than after development.

In areas where area-wide soil contamination is likely, the Task Force recommends that developers conduct soil testing at vacant properties prior to construction and, depending on the results of the individual property evaluations and the future land use, incorporate appropriate protection measures into site development and construction plans to control exposure on the properties after they are developed. Developers, for example, could take advantage of opportunities to contain and cap soil under roads, structures, or landscaping berms during site development. Other options include tilling or blending soils to reduce surface concentrations of arsenic and lead, installing protective barriers and good soil cover, and removing and replacing small quantities of soil, all of which are more cost effective if implemented during rather than after properties have been developed. In general, as discussed in Section 5 above, the level of effectiveness and permanence of the responses should be greatest for proposed land uses where there is the greatest potential for exposure of children, gardeners, and other adults who have frequent contact with soil. The Agencies should set an example by adopting these practices for their construction projects and should work with local health jurisdictions to assist developers with the interpretation of soil sampling results and the selection of appropriate protection measures

The Task Force believes that local land use planning and permitting processes, such as plat notices represent an important opportunity to educate developers about Task Force recommendations and assist developers with implementation of recommended activities. Local planning and permitting officials should be provided with educational materials to distribute to developers, property owners, and others early in the site development process. Materials should provide guidance on how to test soils and on how to select and implement protection measures. To maximize opportunities to take advantage of development activities, developers should be encouraged to test soils early in the development process, for example, as part of the plat application process, rather than when building permits are issued.

The Task Force also recommends that the Agencies educate people who work on State Environmental Policy Act (SEPA) issues in local government, as well as other local planning and permitting officials, about area-wide soil contamination and how to respond appropriately to it. To further ensure the integration of area-wide soil contamination issues into the SEPA process, the Task Force recommends that the SEPA checklist, which is used to determine whether government actions require an environmental impact statement, be modified to incorporate a question about whether the property is located in an area where area-wide soil contamination is likely. The SEPA review process represents another important opportunity for local governments to distribute guidance on sampling and protection measures. For construction activities that are exempt from SEPA requirements, such as the construction of fewer than four single-family homes, the Agencies should work with local governments to leverage

appropriate land-use or building processes to ensure that sampling and implementation of appropriate protection measures is recommended for these development activities as well. Finally, the Task Force encourages property owners to use plat or other notices to record information on the status of property where area-wide soil contamination is likely. Notices should, for example, record whether a property has been sampled and/or whether protection measures are in place.

During construction, the Task Force strongly recommends that construction workers implement individual protection measures to reduce their potential for exposure to contaminated soil, consistent with U.S. Occupational Safety & Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) requirements. Moreover, as a precautionary measure, the heightened awareness and safety precautions required for construction at properties where hazardous substances are known to be present should also be applied at properties where area-wide soil contamination is likely, unless soil sampling shows that elevated levels of contaminants are not present. Finally, since clearing areas for development exposes soils that could generate a lot of dust, the Agencies should work with state and local air authorities to ensure that appropriate precautions, such as frequently spraying construction sites with water, are used to control dust and other particulate emissions during construction.

Vacant Land Not Proposed for Development

At vacant land not proposed for development that is away from residential areas, the potential for exposure to area-wide soil contamination is generally low, since these areas are not likely to be frequented by children or other sensitive populations. The Task Force believes that broad-based education and awareness building activities should be sufficient to address potential health risks from human exposure to area-wide soil contamination in these areas.

For vacant land not proposed for development that is in or near residential areas, where there is the greatest likelihood of exposure, in addition to education and awareness building with parents, the Task Force recommends that the Agencies encourage property owners to take practical steps to limit trespassing on their property, such as posting signs at vacant lots in residential areas. Property owners might also consider taking practical, cost-effective steps to limit the potential for soil exposure and wind-blown dust, such as keeping vacant land covered with grass, hay, or other vegetation.

7e. Ecological Risks

There is a significant body of scientific information demonstrating that high levels of arsenic and lead in soils can adversely impact plants and animals. However, the ecological risks associated with the range of concentrations associated with area-wide soil contamination zones are less well understood. In general, low-to-moderate arsenic and lead soil contamination has been found to adversely impact individual plant or animal species in laboratory studies. At the same time, field studies have uncovered healthy plant and animal communities in areas with similar arsenic and lead concentrations.

Assessments of and responses to ecological risks are further complicated by site-specific circumstances. In general, ecological concerns at developed commercial and residential properties do not trigger response actions beyond those actions that would be necessary to protect human health. Cleanups of larger properties, such as vacant land, raise more complicated concerns. Some Task Force members were concerned about ecological impacts on vacant lands, particularly because the Task Force recommendations for response actions for vacant lands are focused on reducing the potential for humans to be exposed to arsenic and lead in soil through education and awareness building, which will not be effective in protecting ecological receptors. Other Task Force members were not concerned about ecological receptors. Given these varying results of scientific studies and the complexity of these issues, the Task Force recommends that Ecology conduct a study to evaluate the potential ecological impacts associated with low-to-moderate level arsenic and lead soil contamination. The study should be used to identify circumstances where measures beyond those recommended by the Task Force to limit human exposure are needed to protect plants and animals.

8. Real Estate Disclosure Recommendations

[Placeholder for text on real estate disclosure (1-2 pages)]

9. Application of the Model Toxics Control Act

The Area-Wide Soil Contamination Task Force was chartered, in part, to recommend alternatives to traditional ways of addressing contaminated soil with low-to-moderate levels of arsenic and lead contamination under MTCA. The Task Force had a number of concerns about application of traditional

MTCA practices to properties affected by area-wide soil contamination. In particular, given the potential extent of area-wide soil contamination, using traditional MTCA practices could involve site-specific property evaluations and decision making at thousands of individual parcels of land. In light of the practical and institutional difficulties of applying the current MTCA framework to so many individual parcels, and in consideration of the levels of contamination (low-to-moderate) typically associated with area-wide soil contamination problems, the Task Force recommends an alternative approach to the traditional MTCA process. The alternative approach should create an appropriate mechanism to address area-wide soil contamination, while at the same time preserving the elements of MTCA that could work well for area-wide soil contamination and that are appropriate for other, more traditional, hazardous substance cleanup sites.

The Task Force recommends that Ecology modify its regulations and policies to establish an alternative approach under MTCA for properties affected by area-wide soil contamination. This alternative approach should have four elements:

- An alternative to the traditional site listing process that avoids placing individual properties on the Hazardous Sites List.
- An incentive-based system that encourages individuals to take action to address area-wide soil contamination and provides substantial liability protection for property owners who implement recommended actions to address area-wide soil contamination.
- An optional, self-implementing and streamlined system to recognize individuals who test soils and determine that concentrations of arsenic and lead are below cleanup levels or who take action to implement the Task Force recommendations for properties affected by area-wide soil contamination.
- The option for individuals to pursue the traditional MTCA process, if desired, or for Ecology to require the traditional MTCA process if circumstances warrant it.

Each of these elements is described further below.

Area-Wide Designation Process: Alternative to Traditional Site Listing

The Task Force recommends that Ecology modify the MTCA regulations and policies to establish an alternative to the traditional hazardous sites listing process for areas that may be affected by low-to-moderate arsenic and lead soil contamination. As part of this alternative process, Ecology should identify areas where area-wide soil contamination is likely as “area-wide soil contamination zones.” The process of identifying area-wide soil contamination zones should involve mapping areas using community or regional boundary lines, shaded geographic area designations, and/or property category descriptions to locate areas likely to have elevated levels of lead or arsenic. At a minimum, identification of areas-wide soil contamination zones should be at the section level using section, township, and range delineations. The maps included in this report describe where area-wide soil contamination is likely based on available data and should be used as a starting point in identifying area-wide soil contamination zones. The Task Force emphasizes that identification of area-wide soil contamination zones will be a dynamic, iterative process. As more information is obtained by Ecology, the maps and descriptions should be made more precise and informative.

Area-wide soil contamination zones should be included on Ecology’s Confirmed or Suspected Contaminated Sites List (CSCS) but should not be rated or placed on Ecology’s Hazardous Sites List. Because of the variability in distribution of arsenic and lead from historical sources and because of land use changes and development over time, it is important to emphasize on the CSCS and on any maps that some properties inside the area-wide soil contamination zone may not prove to have arsenic or lead present above MTCA cleanup levels and that some properties outside the zone could have arsenic or lead present above cleanup levels. Individual properties within area-wide soil contamination zones should not be listed on either the CSCS or the Hazardous Sites List, unless the property owner chooses the traditional MTCA process or Ecology determines that the traditional process is needed because of site-specific circumstances (e.g., contaminants other than arsenic and lead are present above cleanup levels).

Support for Action within Area-Wide Soil Contamination Zones

As discussed earlier in this report, the Task Force believes that one of the key elements of responding to area-wide soil contamination is to give individuals the information and technical and financial support they need to understand the potential risks associated with area-wide soil contamination and take steps to address the issue consistent with their own lifestyles, property uses, and values. Consistent with this

approach, the Task Force recommends that the Agencies' efforts to target broad-based education and awareness building activities and to support individuals who choose to take action to address the potential for elevated levels of arsenic and lead in soil at their properties be focused within designated area-wide soil contamination zones. These activities are discussed in detail earlier in this report and include:

- Targeted outreach and informational materials for parents, educators, and others who care for children; for home gardeners; and for adults who have frequent contact with soil because of their work (e.g., construction and underground utility workers).
- Support for qualitative and, in some cases, soil testing at individual properties to help individuals make decisions about when and how to protect people from exposures to arsenic and lead in soil.
- Support for implementation of individual protection measures, such as frequently washing hands with soap and water and removing soil from home-grown fruits and vegetables, to minimize the potential for ingestion or inhalation of contaminated soil.
- Assistance with identification and implementation of additional protection measures, such as covering bare soil, particularly in areas where children routinely play.

Liability Protection within Area-Wide Soil Contamination Zones

The Task Force believes strongly that property owners and residents within area-wide soil contamination zones should have assurances about how MTCA liability will likely be applied by Ecology. This is important to allow for orderly transfers and development of properties, and to maintain property values.

The Task Force reiterates its belief that for many developed properties within area-wide soil contamination zones, disciplined practice of individual protection measures and implementation of the other Task Force recommendations is the most appropriate action. In recognition of this, Ecology should adopt a new area-wide soil contamination enforcement forbearance policy, conditioned upon implementation of individual protection measures and other Task Force recommendations, to address all properties with low-to-moderate arsenic and lead soil contamination. This enforcement forbearance policy should provide a reasonable level of liability protection for property owners who implement the Task Force recommendations that apply to their particular land-use scenario. As precedent, Ecology should consider the current residential forbearance policy and the former "plume policy" (now codified in

MTCA), which described Ecology's enforcement discretion relative to owners of property affected by contaminated ground water from other sources.

There may be situations where individual properties appear to have low-to-moderate levels of arsenic or lead in soil but are outside designated area-wide soil contamination zones. In these circumstances, the Task Force recommends that the primary approach should be to revise the boundaries of the area-wide soil contamination zone (or create a new area-wide soil contamination zone) to include the affected properties. Where this is not practical (e.g., where the affected property is far away from all identified zones or is too small to be designated as a zone), Ecology should consider amending the current residential enforcement forbearance policy to provide for implementation of the Task Force recommendations at such properties.

Self-Implementing Mechanism for Recognition that a Site is Clean

In some circumstances, individuals may desire some formal recognition from Ecology regarding the status of a specific property under MTCA. The Task Force believes this will most often be the case during commercial property transactions. The Task Force does not believe this will often be the case at residential properties, because residential property transactions do not typically trigger evaluations under MTCA.

Where a formal, property-specific recognition of an owner's or resident's liability under MTCA is desired, the Task Force recommends that Ecology create a self-implementing process to provide such recognition. The self-implementing process might involve the automated or streamlined issuance of conditional no-further-action letters or certificates, the issuance of a general permit for activities within area-wide contamination areas, or reliance on the MTCA model remedy provisions. For example, if a property owner tests her property inside a designate zone and determines that arsenic and lead are below cleanup levels, then she should be able to self-certify these results, submit them to Ecology and receive a certification from Ecology indicating that the property has been tested and no lead or arsenic of concern was detected. As another example, if a resident inside a designated zone implements the personal protection measures recommended by the Task Force, then he should be able to self-certify those actions and receive a certification from Ecology indicating that he has implemented the Task Force recommendations.

The Task Force believes that recognition should be available in either of the following circumstances:

- Properties have been sampled and sample results show that concentrations of arsenic and lead in soil are below MTCA cleanup levels. Guidance on sampling for individual properties is included in the toolbox of materials recommended by the Task Force.
- Property owners have implemented individual protection measures, together with other Task Force recommendations, that may apply to the particular land-use scenario.

It may be appropriate for Ecology to provide for different types of recognition of a property owner's liability under MTCA in different circumstances. For example, if a property is sampled, sample results show that concentrations of arsenic and lead are below MTCA cleanup levels, and sample results are provided to Ecology for verification, it may be appropriate to provide a stronger liability assurance than would be appropriate at a property where elevated levels remain but are addressed through personal protection measures. Ecology should consider these differences carefully with a view towards providing the most durable liability assurance appropriate to any given property and/or property owner, while at the same time keeping the system of providing liability assurances as simple as possible.

The Task Force emphasizes that over time, the goal should be to move properties into the condition that is most protective of human health and the environment for the long term. This means that, over time, individuals who own property within area-wide soil contamination areas, particularly property where children routinely play, should be encouraged to implement the Task Force recommendations that go beyond individual protection measures and incentives should be provided to encourage such activities.

Traditional MTCA Process Remains Available

Finally, the Task Force recognizes that there will be some circumstances in which the traditional MTCA approach is appropriate, either because a property owner wants to use the traditional MTCA process or because Ecology determines that site-specific conditions warrant use of the traditional MTCA process. These situations may include:

- Properties where contaminants other than arsenic and lead are found.
- Properties where there is ground water contamination.

- Properties where arsenic or lead are found at high levels.
- Properties where the owner has implemented what would traditionally be considered a final remedy under MTCA and therefore desires a settlement or other traditional MTCA liability assurance.

Ecology should monitor, in an informal way, circumstances within area-wide soil contamination zones where the traditional MTCA approach is used. This information should be used to refine application of MTCA within area-wide soil contamination zones over time. For example, Ecology might consider establishing a model remedy under MTCA if owners of commercial properties are routinely adding institutional controls to implementation of the Task Force recommendations, thereby implementing a remedy that would likely be considered a final remedy under MTCA that deserves formal recognition under the traditional MTCA process.

10. Recommendations for Additional Information Needed

Recommendations for Data Gathering on Arsenic and Lead Exposure

In order to develop recommendations for responding to area-wide soil contamination, the Task Force had repeated discussions about the implications that elevated levels of arsenic and lead in soil may have for the health of Washington State residents. Based on these discussions, the Task Force understands there is only limited information available on the actual health of Washington residents who, because of where they live, work, or go to school, may be exposed to elevated levels of arsenic and lead in soil. The Task Force is concerned about this lack of health data for Washington residents, particularly with respect to children, who may be at greatest risk.

The Task Force encourages the Washington Department of Health, in partnership with other agencies as appropriate, to expand its use of blood-lead testing, fluoroscopy, or any other appropriate techniques to gather additional information on the health of Washington residents, particularly children, who may be exposed to arsenic and lead. The Task Force believes it is important that the Department of Health look at both arsenic and lead, even though the methodology for evaluating arsenic exposure is still under

development. Furthermore, any studies should not be directed only at voluntary subpopulations, but should be representative of all of Washington residents who might be exposed to lead or arsenic in the soil. Appropriate use of random testing and finding ways to eliminate or minimize the effects of confounding factors, such as smoking and home remedies, are also needed to give a better picture of how the health of Washington residents might be affected by lead and arsenic in the soil.

The Task Force felt so strongly that additional information on the health of Washington residents who may be exposed to elevated levels of arsenic and lead in soil is needed that it offered this recommendation to the Department of Health approximately mid-way through the Task Force process. The Task Force acknowledges and appreciates the Department of Health's concern about the practicality of implementing this recommendation and about the need to apply the precautionary principle to potentially exposed populations. Nonetheless, the Task Force continues to feel strongly that gathering additional information on the health of Washington residents is an important element of continuing to refine understanding of the effects of area-wide soil contamination and thereby focus response actions over time.

11. Funding Recommendations

The Task Force was asked by the Agencies to recommend possible funding sources for agency activities to address area-wide soil contamination. As part of this charge, the Task Force discussed which agencies, organizations, or individuals should pay for the activities the Task Force recommends to respond to area-wide soil contamination. A central theme in these discussions was that the state government, and in particular the Agencies, should provide financial assistance for local government efforts to address area-wide soil contamination, particularly the activities of local health jurisdictions, to avoid establishing unfunded mandates. At the same time, the Task Force recognizes that state agencies do not have limitless resources and that there are competing demands for the use of available resources. This creates a need to target available resources effectively and seek additional funding from a broad array of potential sources.

To inform the Task Force's deliberations on possible funding sources and funding priorities, the contractor support team for the project developed ballpark estimates of the costs to implement the Task Force's recommendations and researched potential funding sources for those recommendations. Summaries of these cost estimates and potential funding sources are provided below. Section 12 below discusses the Task Force's recommendations for institutional and implementation priorities.

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Cost Estimates

The contractor project team developed the following estimates of the costs to implement the Task Force’s recommendations. These represent ballpark, mid-range estimates (+/- 50%). Actual costs will vary according to the type and number of the activities implemented, the geographic extent of where activities are implemented, the level of effort and operating expenses of the implementing entities, and many other factors.

Table 4: Cost Estimates for the Task Force’s Recommendations

Activity	Unit Costs	Statewide 10-Year Costs	Notes/Assumptions
Broad-Based Education and Awareness Building			
Developing Educational Materials, Providing Training and Support	\$150,000/yr	\$900,000	Assumes 3 years to develop materials and do trainings – twice over 10-year period
Education Program Implementation (by Local Health Jurisdictions)	\$120,000/yr (large populations), \$65,000/yr (small populations)	\$6.3 million	Assumes King & Pierce County health departments use 1 FTE; the other 6 high-likelihood counties ¹ use 0.5 FTE
Development of Daycare Certification Program	\$50,000	\$50,000	Assumes implementation costs for education covered in above
Maps of Area-Wide Soil Contamination			
Initial Scoping Studies for Lead Arsenate Maps	\$10,000	\$100,000	For 10 counties
Tier 1 Lead Arsenate Maps (by County)	\$5,000	\$25,000	Based on costs for existing tier 1 county maps, for 5 counties
Tier 2 Lead Arsenate Maps (Identifying Orchards)	\$35,000	\$175,000	Based on costs for Yakima map, for 5 counties
Defining Area-Wide Zones	TBD		
Data Management, Maintaining/Updating Maps	\$18,000/yr	\$180,000	Assumes 0.2 FTE
Property Evaluations			
Qualitative Assessments (Child-Use Areas)	\$50	\$105,000	\$50 for 1 hour assistance / one-on-one education for 2,100 child-use areas ²
Sampling – Schools	\$4,000	\$1.2 million	200 elementary schools & 100 high/middle schools
Sampling – Parks	\$3,000	\$1.5 million	500 parks
Sampling – Childcare Centers & Family Home Daycares	\$2,000/center, \$1,600/family home	\$2.2 million	300 childcare centers; 1,000 family homes
Sampling – residential do-it-yourself sampling & lab analysis ³	\$200	\$10 million	\$50/sample, 4 samples/property; for 50,000 residences
Individual Protection Measures			
	minimal	minimal	
Additional Protection measures			
Deed/Plat Notices			

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Activity	Unit Costs	Statewide 10-Year Costs	Notes/Assumptions
Soil Cover			
Measures to Reduce Contamination			
Maintenance of Soil Cover			
Steps to Limit Trespassing on Vacant Land			
Monitoring/Evaluation of Protection measures			
Evaluation of Education Program and Individual Protection Measures	\$25,000	\$400,000	Assumes Agencies do 2 evaluations (with 0.25 FTE) for each high-likelihood county
Regulatory/Policy Development			
Changes to Real Estate Disclosure Requirements			
Establishing a Self-Executing System for the Alternate MTCA Approach			
Research			
Research on Contamination from Leaded Gasoline	\$70,000	\$70,000	Estimate for initial study only
Research on Ecological Risks			
Health Monitoring Research			

Notes:

1. For the purposes of these estimates, “high-likelihood counties” are those counties that have the greatest numbers of acres potentially affected by smelter emissions and/or use of lead arsenate pesticides. These counties are King, Pierce, Snohomish, Stevens, Chelan, Okanogan, Spokane, and Yakima counties.
2. Child-use area numbers are based on information from local health departments, OSPI, and DSHS.
3. For comparison, sampling conducted by trained consultants or agency staff is estimated to cost about \$1,600 per comparison, or \$80 million for 50,000 residences.

Possible Funding Sources

The Task Force recommends that the Agencies expand the use of the State and Local Toxics Accounts to support actions to address area-wide soil contamination. The State Toxics Account supports state agency efforts, including the hazardous sites cleanup program, while the Local Toxics Account provides funding to local governments and non-profit organizations for public education and outreach, individual property evaluations, cleanup actions, and other activities. The Task Force also recommends that other state funding programs, including state school construction funds, should be leveraged to provide priority for activities that address area-wide soil contamination issues. This could occur, for example, by modifying the criteria or processes for distribution of funds to prioritize area-wide soil contamination activities.

Furthermore, the Task Force recommends that the Agencies seek supplementary funding from potentially liable parties for area-wide soil contamination, private foundations, federal grant programs, and other

federal, state, and private sources. The Task Force emphasizes that residential property owners and others who did not contribute to area-wide soil contamination are likely not, in the Task Force's view, potentially liable parties. Specific examples of potential funding sources include federal grant programs, such as Environmental Protection Agency (EPA) Environmental Education Grants and the Department of Housing and Urban Development (HUD) Community Development Block Grants, grants from private sources such as the Bullitt Foundation and the DuPont *Lead-Safe...for Kids' Sake* grant program, and potentially liable parties such as pesticide manufacturers and smelter operators. These and other potential funding sources are summarized in Appendix G.

12. Institutional and Implementation Priorities

[Placeholder for text institutional priorities]

13. Summary / Conclusions (3-4 pages)

[Placeholder for summary]

14. Glossary of Terms and Uses

- “Elevated” and “contaminated” both mean that soil has concentrations of arsenic or lead greater than the current MTCA cleanup standards of 20 parts per million (ppm) arsenic and 250 ppm lead.
- “Ingestion” means to swallow contaminated soil, either from inhaling and then swallowing soil particles (the most common method) or by directly placing soil into the mouth.
- “Low-to-moderate level” contamination means concentrations that are generally higher than those naturally present in Washington soils but generally lower than those found in areas where smelting operations occurred or where lead arsenate pesticides were mixed and formulated.

- “Child-use area” means any area that children routinely use and play in, including schools, parks, commercial childcare centers, and home-based childcare facilities.

[Placeholder for additional definitions.]

15. Appendices

- Appendix A: Task Force Roster, Project Map, and List of Meeting Locations and Dates
- Appendix B: Summary of Public Review and Comment Process
- Appendix C: Summary of the Information Survey
- Appendix D: Institutional Frameworks Case Studies
- Appendix E: Protection measures Evaluation Tables
- Appendix F: Area-Wide Soil Contamination Toolbox
- Appendix G: Summary Table of Potential Funding Sources
- Appendix H: Summary Table of Task Force Recommendations